



Fig. 23



Fig. 24



Fig. 5

Fig. 23. Roentgenogram taken 5 years after protrusion of the fifth lumbar disc was removed. The preoperative roentgenogram was normal. This film shows narrowing of the fifth disc and also of the fourth disc.

Fig. 24. Roentgenogram taken 4 years after protrusion of the lumbosacral disc was removed. The preoperative

roentgenogram was normal. This film shows narrowing of the fifth disc and also of the fourth disc.

Fig. 25. Roentgenogram taken 3 years after a protrusion of the fourth disc was removed. The preoperative roentgenogram was normal. This roentgenogram shows narrowing of the fourth disc and also of the fifth disc.

Follow up after from 1 to 5 years showed that 11 patients were cured, 5 had a slight recurrence, 1 had marked pain, and 4 could not be traced.

Two of the cured patients complained of weakness of the back and 1, although without sciatic pain, had persistent pain in front of the thigh.

The results from 12 to 18 months after operation in the military cases showed that no patients were cured, 5 were benefited, and 12 were not benefited.

After from 1 to 5 years, 6 of the military patients were in Category E and 11 were in Category C. (British Army Medical Classification.)

Thickened ligamentum flavum—(14 cases) The immediate results showed that 10 patients were cured, 3 were benefited, and 1 patient was not benefited. Follow up after from 1 to 5 years later showed that 5 patients remained symptomless, 6 had some sciatic pain, and 3 could not be traced.

No pathology discovered in disc or ligamentum flavum (15 cases)

Of these patients, 9 were subjected to spinal arthrectomy either combined with laminectomy or followed by laminectomy and the results have already been considered.

The remaining 6 cases include the 2 in which an exudate (considered to be the result of lipiodol injection) was found around the nerve roots.

The immediate results showed that 4 patients were cured, 1 was benefited, 1 not benefited.

Follow up after from 1 to 5 years showed that 3 patients remained symptomless, 1 patient had some sciatic pain, and 2 patients could not be traced.

Spondylolisthesis (1 case) Laminectomy was performed. There was no disc protrusion. A spinal fusion was done. The patient obtained partial relief.

TABLE IV — THE OPERATIONS AND THE TOTAL RESULTS

Result	Disc	Ligt. Flavum	No Pathology	Spondy. Isthmect.	Arthrectomy	Total
Cured	11	5	3	0	25	44
Still having pain	24	6	1	1	22	54
Not traced	8	3	2	0	3	16
Total	40	14	6	1	50	116



Fig. 26



Fig. 27

Fig. 26. Roentgenogram taken 3 years after a "concealed disc" (lumbosacral) had been exposed. At the operation no disc material was removed. The preoperative roentgenogram was normal. This roentgenogram shows narrowing of the fifth disc and also of the fourth disc.

Fig. 27. Roentgenogram taken 3 years after a protrusion of the fifth disc was removed. The preoperative roentgenogram was normal. This roentgenogram shows narrowing of the lumbar sacral disc and also of the third and fourth discs.

The consolidated operative results are shown in Table IV. Following the disc operations (including the military cases) 11 of 40 patients were cured (27%) or 11 of 35 cases that were traced were cured (31%).

Following arthroectomy 25 of 55 patients were cured (45%) or 25 of 47 cases that were traced were cured (53%).

This survey is incomplete because of the war-time difficulty of follow-up but it is sufficiently clear that the results of operation for disc protrusion are not uniformly good. It must however be emphasized that the results are satisfactory in the sense that when pain persists or recurs it is never as severe or disabling as the preoperative pain.

All the civilian patients were satisfied with the operation.

The possible causes of persistence or recurrence of pain after operation are obvious. The disc necessarily remains defective after operation whether it is a concealed bulging or degenerated disc from which no material is removed or a disc with a definite sequestrum. In the last case excision of the sequestrum removes the immediate cause of the pain but it does not restore a normal

anatomy. The spinal blemish is permanent and may be a cause of reflex pain. It also weakens the back, and patients do in fact, frequently complain of continued backache and a feeling of weakness in the back after operation. Further a recurrent protrusion may occur. Love and Walsh report recurrence in 2 per cent of their cases.

In our series there was 1 case of proved recurrence in which 2 years after removal of a prolapsed nucleus had completely cured the sciatica, severe recurrence of pain occurred on the same side. A second operation was performed and a large protrusion at the same level was removed. Much material came away as though almost the whole of the disc remaining after the first operation had degenerated (Fig. 21).

This case also illustrates yet another complication—narrowing of the disc after a protrusion has been removed. The original roentgenogram of this patient showed nothing abnormal, but at the time of the second operation the lumbosacral disc was a little narrowed. Three months after the second operation the lumbosacral disc was attenuated, and there was subluxation of the lateral joints at this level and a little backward displacement of the fifth lumbar vertebral body. Subsequent

roentgenograms showed progressive narrowing of the disc (Fig. 22). This patient continues to have pain, now less severe than before the recurrent protrusion was removed, but it is likely to become progressively worse.

Postoperative narrowing of the disc space is, of course, a significant finding; the mechanical result of acquired narrowing being posterior displacement of the upper vertebral body subluxation of the lateral joints between the two bodies, and constriction of the intervertebral foramen.

At the present time we have been able to obtain late postoperative roentgenograms of only 17 of our disc cases (including the case illustrated in Fig. 22). The preoperative roentgenograms in each of the 17 cases were normal. In 10 of these cases, however, the late postoperative roentgenograms show degenerative changes, as follows:

In 4, the disc operated upon has become narrow.

In 5 there is narrowing of the disc operated upon, and also narrowing of an adjacent disc (Figs. 23-26).

In 1 case there is narrowing of the disc operated upon, and of two other discs, in addition (Fig. 27).

It is clear therefore, that progressive post operative degeneration of one or more discs is by no means uncommon. This fact must be considered in planning the treatment in these cases. The object of the operation should be, not only to relieve the pressure on a nerve root, if indeed any root is being pressed upon, but also to avoid ill effects from the subsequent degeneration which may be expected.

SELECTION OF CASES FOR OPERATION

There is no doubt that cases with abnormal neurological signs indicating pressure on a nerve root and interference with conduction in the root give better immediate results than those in which the pain is of a referred type, without any interference with conduction. Those with abnormal neurological signs recover more quickly and more completely. The immediate relief from severe pain is striking. When there is no loss of conduction the immediate results are often disappointing. The pain is at first only partially relieved and recovery which progresses slowly over a period of months, may in the end be incomplete.

These observations raise the question of the type of operation to be performed.

1 When a protrusion is to be removed, a laminectomy with ample bone removal and wide exposure is advisable.

2 If there is no protrusion, but the disc is degenerate, it was for some time our custom to complete the operation as an arthrectomy and to

remove the lateral joint. This operation "decompresses" the nerve root and, as a rule, gives satisfactory results. In some cases of this sort, however spinal fusion has been done, i.e., when the presence of degeneration without protrusion has been verified, an Albee graft is applied, the laminae and lateral joints being left intact. This procedure seems rational, the fusion being intended to protect the degenerated disc from further strain or injury. Further observation will determine its value.

3 For cases with arthritic changes in the lateral joints, confirmed by roentgenography arthrectomy is the operation of choice. These changes are usually found in patients in the fifth or sixth decades.

When the laminae have been exposed in the approach to the joints, it is advisable to explore the interlaminar spaces to make certain that the discs are normal before the joints are excised.

SUMMARY

1 A modern tendency to overemphasize the importance of the protruded intervertebral disc as a cause of sciatica is noted.

2 The nature of sciatic pain is analyzed with particular attention to the importance of referred pain.

3. The clinical characteristics, diagnosis, and differential diagnosis of sciatica are discussed.

4. The article is based upon a study of 298 cases of sciatica.

I wish to record my gratitude to Mr. Blundell Bankart and to Mr. Philip Wiles for so kindly placing their case records at my disposal, and to Miss Muriel Crouch for her expert help in the preparation of this article, and in the treatment of many of the cases recorded in it.

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ABSTRACTS OF CURRENT LITERATURE

SURGERY OF THE HEAD AND NECK

EYE

Lee Otis S., Jr.: Corneoepidural Suture in Operations for Cataract, with Special Reference to the Incidence of Postoperative Hypphema. *Arch Ophth., Chic.*, 1947 37 59

Recent investigations have shown that the source of postoperative hemorrhage into the anterior chamber is from the new blood vessels that are growing into the incision. Any separation of the lips of the wound tears these vessels and results in bleeding under the conjunctiva or more frequently into the anterior chamber.

The purpose of this article is to compare the occurrence of postoperative anterior chamber hemorrhage in those patients who have had three or more interrupted limbic-epidural sutures for the closure of the incision with such occurrence in patients who have had a modified Liépard suture with a additional limbic-epidural sutures. In placing this modified Liépard suture the globe is fixed with a Burch pick which is placed opposite the point at which the needle is to penetrate the corneal tissue. A bite is taken in the limbus at twelve o'clock, parallel to the limbus and from 1.5 to 2 mm. wide. The thread is pulled through until it is stopped by a previously prepared double knot about 3 cm. from the end. The needle is reversed and with fixation, is transferred to the opposite side. A bite is taken from 1.5 to 2 mm. above the first one, the needle passing through the conjunctiva and scleral tissue and out again. The scleral bite is equal in width, and lies exactly opposite to the limbic suture.

In the first 150 cases from 3 to 5 interrupted limbic-epidural sutures were used in one half of this series a complete iridectomy was done whereas in the other half only a small peripheral iridectomy was done. No significant difference in the number of hemorrhages into the anterior chamber was found between these two groups. In the next series of 50 cases a modified Liépard stitch was used in addition to the interrupted corneoepidural sutures. In this group all cataracts were extracted through an intact sphincter pupillae with a small peripheral iridectomy performed in each case. A comparison showed an incidence of postoperative hypphema in 15.3 per cent of the first series and in 6.6 per cent of the second series in which the modified Liépard suture was used. In the second series the bleeding was less severe.

The author postulates that the poor results with the interrupted limbic-epidural sutures may have been due to the fact that many were limbic-conjunctival rather than epidural and therefore unable to hold the wound in as close apposition. The

modified Liépard suture is preferred since it is easy to place, requires no conjunctival flap may be quickly closed and may be used to open the wound for the insertion of instruments. Care should be taken that the horizontal bites are placed opposite each other and that the sutures are not tied too tightly.

ROBERT H. JOHNSON, M.D.

Owens, William Councilman; and Hughes, William F., Jr.: Intracocular Hemorrhage in Cataract Extraction. *Arch Ophth., Chic.*, 1947 37 56

The authors reviewed 3,086 extractions of uncomplicated senile cataract to determine what factors in the patient's physical status or in the operative technique produced intracocular hemorrhage, how these factors could be controlled and what effect each type of hemorrhage had on the post-operative course and visual result. Three types of intracocular hemorrhage were evaluated in this study. Postoperative hemorrhage into the anterior chamber occurred in 9.3 per cent of the cases 3.6 per cent of these were designated as severe because the hemorrhages either filled the anterior chamber completely or were recurrent. The most frequent time of onset was between the second and the sixth days. The age, blood pressure, and prothrombin levels had no relationship to the post-operative hemorrhage.

The diabetics as a group showed only a slight increase in the tendency toward postoperative hypphema; however diabetics of long standing or who required large amounts of insulin showed a sharp increase in the incidence of severe hemorrhage. The blood sugar level or presence of central retinitis made no difference in the incidence of postoperative hemorrhage. Syphilis and the presence or absence of foci of infection had no bearing.

The type of extraction had an effect on the number of hemorrhages but both the use of a corneoepidural suture and a shallow section reduced the incidence considerably. There was a very slight increase in the incidence of postoperative hemorrhage into the anterior chamber following full iridectomies, and a progressive increase in hemorrhages with the loss of increasing amounts of vitreous. No relationship was found between postoperative hemorrhage and the visible gaping of the wound, delayed reformation of the anterior chamber, prolapse of the iris, or iridocyclitis. The authors believed that the bleeding resulted from the rupture of the small capillaries that had grown into the healing incision.

The major cause of the significantly poorer visual results in cases of postoperative hemorrhage into the anterior chamber was found to be due to seepage of blood into the vitreous with its resultant opacities.

Postoperative hemorrhage did not predispose to late secondary glaucoma or phthisis bulbi. Blood remained more frequently in the anterior chamber at the end of the operation because of unusually severe bleeding in older patients and in patients in whom the sections had been placed more deeply and had no effect on the visual results.

To this series there were 3 explosive hemorrhages which the authors did not believe were related to the blood pressure.

ROGER H. JOHNSON, M.D.

Yasuna, Elton R.: Danger of Penicillin Therapy in Active Uveitis. *Arch Ophthalmol* 1947 37 598

Since even following massive doses only negligible amounts of penicillin reach the aqueous vitreous and lens by intravenous, intramuscular and oral routes, other methods of administration have been employed in ophthalmology. Application directly to the cornea and conjunctiva gives excellent concentrations on the anterior surface of the globe. The use of iontophoresis, wetting agents, and cotton packs saturated with penicillin and placed in the lower fornix has proved a satisfactory and convenient method of obtaining higher levels in the cornea, aqueous, iris and ciliary body. Penicillin has been found to be excellent in the treatment of ophthalmia neonatorum and to be a therapeutic aid in both acute and chronic trachoma; however reports by various authors on the value of penicillin in the treatment of infectious conditions of the inner eye have not been in agreement.

The author cites a case of acute iridocyclitis, one a recurrent type and the other following traumatic surgery which were treated by the usual methods in addition to small intramuscular doses of penicillin. Both cases became progressively worse but on cessation of the penicillin therapy showed rapid improvement. Recent investigations have tended to show that a uveitis may be caused by a hypersensitivity of the eye to the bacterial products emanating from the primary focus of infection rather than to bacteria lodging in the uvea. Penicillin is generally agreed to be not only bacteriostatic but also bacteriocidal. The author suggests that the use of penicillin kills bacteria in the foci and releases more bacterial end products into the blood stream. This increases the amount of bacterial toxins in the blood stream and thereby increases the already active uveitis. By stopping the penicillin and thereby stopping the breakdown of the bacteria, the uveitis could improve.

Since most observers believe that penicillin is not of value in uveitis, the author thinks that it would be more advisable not to employ the drug especially when it may actually be dangerous.

ROGER H. JOHNSON, M.D.

Zondek, H. and Wolfsohn G.: Glaucoma and Pituitary Function. *Am J Ophthalmol* 1947 30 596

The authors discuss the relationship between primary glaucoma and the pituitary-diencephalic system. They point out that endocrine factors such as

the thyroid, pituitary gonads, and the corticoadrenal system have been considered as possibly responsible for primary glaucoma. A similar relationship between a number of other ocular diseases (retinitis pigmentosa, the Lawrence-Moore-Biedl syndrome, pituitary-diencephalic exophthalmos, etc.) and the pituitary body (the diencephalic pituitary system) has been established.

In a series of 22 cases of primary glaucoma, tests were made of the carbohydrate and water metabolism, basal metabolism, blood cholesterol and of the osseous structure of the skull. Of these 16 cases presented evidence which indicated disturbances in the pituitary-diencephalic system: obesity, menstrual disturbances, disordered carbohydrate metabolism, water retention, abnormal basal metabolic rates, elevated blood cholesterol, decalcification or atrophy of the sella turcica (occasionally calcification) and congestion of the meningeal vessels. Six of the 16 patients presented pituitary tumors, and 2 of these presented characteristics of acromegaly.

Only 6 of the total number of 22 cases presented no evidence of pituitary-diencephalic disturbances.

The authors suggest the term pituitary diencephalic glaucoma, to correspond with the accepted term pituitary-diencephalic exophthalmos, to designate those cases of primary glaucoma which present pituitary-diencephalic symptoms.

JOSHUA ZUCKERMAN, M.D.

Reese, A. B.: Pigmented Tumors. *Am J Ophthalmol* 1947 39 537

The author discusses pigmented tumors. Melanoblasts produce pigment called melanin. Because little is known about these cells and their product, great differences of opinion exist regarding them.

The term melanin is applied to any black, brown or tan pigment and any heterogeneous group of pigments which possess the common characteristic of absorbing visible light uniformly.

There are various types of melanoblasts from which various types of tumors arise.

Ophthalmologists encounter nevi of the skin, of the eyelids and more commonly of the conjunctiva particularly at the limbus and coruncle.

Nevi are congenital but are not visible at birth. They grow during the first decade of life and become pigmented between the ages of 4 and 14 years especially at puberty at which time they are usually noticed first. They regress in later life and occasionally disappear spontaneously and completely. A nevus can develop into a malignant tumor but this occurs very rarely.

It is pointed out that pigmented tumors seem to differ genetically, histologically and clinically but all have one factor in common—pigment. The pigment is so conspicuous that it dominates the histologic and clinical picture. The author believes that instead of diagnosing all tumors which harbor pigment as melanomas, they should be designated by terms which connote their separate entities. He suggests the following terminology: (1) benign and



Fig. 1.



Fig. 2.



Fig. 3.



Fig. 4.



Fig. 5.



Fig. 6.



Fig. 7.



Fig. 8.



Fig. 9.



Fig. 10.



Fig. 11.



Fig. 12.

Radical Single Stage Extirpation for Cancer of the Large Bowel with Retained Functional Anus—W. Wayne Babcock



Fig. 13



Fig. 14.



Fig. 15



Fig. 16.



Fig. 17



Fig. 18.



Fig. 19.



Fig. 20



Fig. 21.



Fig. 22.

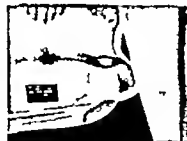


Fig. 23.



Fig. 24.

SURGERY GYNECOLOGY AND OBSTETRICS

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RADICAL SINGLE STAGE EXTIRPATION FOR CANCER OF THE LARGE BOWEL, WITH RETAINED FUNCTIONAL ANUS

W WAYNE BARCOCK, M.D. F.A.C.S. Philadelphia, Pennsylvania

FOR years the Miles operation for cancer of the rectum and rectosigmoid has been the most popular procedure of North American surgeons. The operation has been found to be radical, the technique is not difficult to master and in skilled hands the mortality has been relatively low. The operation, however, has not been popular with the patient, for he objects to the abdominal colostomy, the postoperative impotence, the not infrequent persistent urinary dysfunction and the occasional abdominal or perineal hernia. The operation also removes the means of making an early diagnosis of a pelvic recurrence by palpation through the bowel. These objections are largely due to the removal of the anus and part of the pelvic floor based

upon Miles's belief that rectal cancers spread downward, upward, and laterally. The pathological studies of Westhuys and others (4-9) have shown that it is rare for rectal cancer to invade tissues more than 3 centimeters below the growth, which also is corroborated by our own clinical experience. As the anus with its different lymphatic spread, is primarily involved in hardly 3 per cent of cancers of the large bowel it is evident that for most patients with cancer of the rectum sacrifice of the anus and pelvic floor is unnecessary. However the marked tendency to an upward and lateral lymphatic extension of rectal cancer can properly be met only by exposure and liberation through the anterior abdominal wall. Beginning in 1904 I tried various perineal and sacral methods of resection for cancer of

in a towel and laid over the pubis. The sigmoid is held against the pubis by a towel, the pelvis is inspected and cleared of clots, and the first deep suture of No. 32 stainless steel wire has been inserted into the levators but not tied.

Fig. 9. The open pelvic floor is being closed in the mid line by three rows of buried interrupted sutures of No. 32 wire.

Fig. 10. The skin has been closed with interrupted sutures of No. 35 wire. The divided sphincters are not united.

Fig. 11. A finger tests the wound closure to make sure that the sigmoid will not be strangulated by secondary swelling.

Fig. 12. Perineal gauze dressings moistened with compound tincture of benzoin have been applied, the sigmoid has been divided 6 centimeters from the skin, and a No. 28 rectal tube has been tied in.

Fig. 1. The midline perineal incisions used.

Fig. 2. The incision divides the sphincters posteriorly and passes through the pelvic floor to the right side of the coccyx, which is not removed.

Fig. 3. The rectum is divided by scissors just above the sphincters as the upper rectal edge is grasped by a series of forceps.

Fig. 4. Four hemostatic forceps have now been attached to the upper edge of the partly divided rectum for light traction. The isolated gauze within the rectum is shown.

Fig. 5. Rectosigmoid free from all lower attachments.

Fig. 6. The rectosigmoid is withdrawn from the pelvis with the attached gauze tape, which indicates the lowest level of viable sigmoid.

Fig. 7. Withdrawn bowel showing lymphatic gland bearing mesosigmoid for removal.

Fig. 8. The withdrawn rectosigmoid has been wrapped

From the Surgical Department of Temple University

the rectum, with or without retention of the anus but, like others, found these operations sufficiently radical and associated with too high a percentage of postoperative complications. Turning to the more radical abdominoperineal operations, by 1939 I began to do the resection without colostomy or mutilation of the pelvic floor. In the development of the operation it was found that the viable sigmoid used to form the abdominal colostomy in the Miles operation usually was long enough (1 cm) to be brought through the perineum. I have since transplanted to the perineum over 25 abdominal colostomies left after the Miles or other type of resection and these patients have found the perineal opening without sphincters to require less protection to be much more convenient to care for and less offensive from the escape of colonic gas than the previous abdominal colostomy.

It is desired to show iconographically by photographs of patients taken during immediately after and months and years after operation the marked advantages of the method of abdominoperineal proctosigmoidectomy now used. The entire rectum and lower half of the sigmoid is removed, tributary lymphatics are resected to a high level and the upper sigmoid is brought through the anus to unite spontaneously with the anal mucosa at the upper margin of the sphincters. The perineal part of the operation injures no important nerves or vessels and leaves a normal appearing and functional anus and perineum without the tendency to fistula or sinus formation or to mucous prolapse of the Hochenegg or other conventional posterior resections, in which the sphincters are preserved.

The defecation sense or warning that the lower bowel has filled and should be emptied often is present a few days after the operation. Voluntary contractions of the sphincters are produced at will, and nearly all of the patients after 4 to 8 weeks are able to dispense with a protective pad most, if not all of the time.

TECHNIQUE OF THE ABDOMINO-PERINEAL RESECTION

Before operation the usual laboratory studies are made, and sulfasuxidine is given at 4 hour intervals for 3 to 5 days. Laxatives and en-

emas are used unless there is complete or nearly complete intestinal obstruction when a catheter appendicostomy or cecostomy is formed through a small muscle-splitting incision, and the colon decompressed by irrigations every 2 to 4 hours with a 25 per cent glycerin solution or 10 per cent hydrogen peroxide. Parenteral feeding or transfusions are used before operation only for the very debilitated patient. The anesthesia is by spinal injection of 12 to 14 milligrams of pontocaine in 1 per cent solution to which largely to make it hyperbaric, 100 milligrams of procaine (novocain) is added. This is given through the first or second lumbar interspace, and the patient's head and chest are raised 10 degrees for the first 10 minutes, and then lowered. The analgesia usually lasts 2 to 3 hours. If Lemon's fractional method of spinal anesthesia is used it is desirable to inject a sufficient amount of the drug to prolong the anesthesia for an hour and to withdraw the needle just before the patient is put in position for the perineal part of the operation. In any case, an intravenous infusion is started immediately after the anesthetic is injected from 500 to 1000 cubic centimeters of 5 per cent glucose followed by 500 cubic centimeters of blood usually being given. For marked hypotension the head is lowered, and 1 per cent procaine containing 1 minim of epinephrine (1:1000) in each 10 cubic centimeters is freely injected about the wound field or rarely a few drops of dilute epinephrine solution are added to the infusion. With the exception of 1 patient with thousands of metastatic growths in his internal organs, in no case has sufficient shock or collapse developed to prevent the completion of the desired operation.

Abdominal phase The preferred abdominal incision runs parallel with and 3 centimeters above the left inguinal ligament (Fig 18) through the lateral edges of the sheaths of the left rectus muscle. The deep epigastric vessels are exposed divided and ligated and the peritoneum is opened. With this incision the strong oponeurotic layers rather than muscle are divided in the depths of the wound. Should more room be required, the median portion of the incision may be carried through one or both recti, and laterally the incision may be

lique. This anatomic incision gives satisfactory exposure and the undivided upper abdominal wall holds the small intestine and retentive pads in place better than with a vertical incision and rarely leads to a secondary hernia. If there is a lower median scar a vertical incision is substituted by excising the scar. The upper abdominal organs and finally the pelvic organs are explored by palpation. The left lateral peritoneal leaflet of the sigmoid is divided the left spermatic or ovarian veins are displaced laterally or divided and ligated and the left ureter recognized by its trombone-like movements on irritation is freed from the peritoneum nearly to the bladder. The peritoneal incision is continued lateral to the rectum to and then across the reflection of the bladder in men or the cervix in women. The hand is introduced from the left side under the attached bowel and mesentery from the great vessels and underlying sacrum to the coccyx any enlarged lymph nodes being particularly noted to the right of the bowel and along the elevated superior hemorrhoidal vessels. The inferior mesenteric vessels are doubly ligated with transfexion and divided below the left colic artery usually also the first sigmoid branch to enable the sigmoid curve to be straightened. The mesosigmoid is then divided to the bowel, usually between the first and second sigmoid arteries. Avoiding the ureter and sacral veins the peritoneum is divided well to the right of the rectum superior hemorrhoidal vessels and lymph nodes, and the incision is continued to the first peritoneal incision from the left side of the rectum. The lateral lower rectal vessels are then located and divided wide of the rectum, these vessels usually not requiring ligation. With the aid of a trowel and long scissors the rectum is separated from the vesical and prostate or in the female, from the upper vagina. The sigmoid proximal to its divided mesentery is now tested for vascularity by dividing small vessels on its surface and a sufficient viable length (12 cm) is liberated to reach from the sacral promontory through the pelvic floor. This may necessitate some mobilization of the lower part of the descending colon with division of its lateral peritoneal leaflet. A soft tape of folded gauze 1 meter long by 4 centimeters in width is tied about the sigmoid at the level of proved vascularity and the ends are packed back of the rectum against the floor of the pelvis. This gauze by pressure controls capillary oozing serves as a guide in the perineal phase of the operation and enables traction to be made on healthy, rather than cancerous bowel. The denuded pelvis is not peritonealized and a peritoneal pelvic diaphragm has been found unnecessary. Thus the bladder is not displaced over the intestinal coils after the rectosigmoid has been placed in the pelvis. The deeper layers of the abdomen are then closed preferably with interrupted layer sutures of No. 30 and No. 32 gauge stainless steel wire, which are tied in a square knot and the ends cut off very close to the knot. The skin and subcutaneous fat are united with interrupted No. 35 and continuous No. 38 stainless steel wire.

To remove blood and serous exudate from the pelvis during the early days after the operation, a perforated suction ("sump") drain (Fig. 18) 8 to 10 millimeters in diameter is carried on the left side of the bowel to the bottom of the pelvis and brought out through or near the lower angle of the incision. Low pressure aspiration of the inner tube of the drain is continued as by a small electric pump during the first 3 or 4 days after the operation. The intra abdominal sump drain empties the pelvis of fluid that may serve as a culture medium or diffuse bacteria. It also immediately indicates the onset of a postoperative hemorrhage, its degree persistence or arrest. It gives the earliest sign of ileus by a sudden aspiration of quantities of clear serum 24 to 40 hours before distention tympany and vomiting attract attention. Guided by this warning an aspirating indwelling duodenal tube is immediately introduced and often promptly relieves the obstruction. Likewise the drain will give the earliest indication of an infection in the depths of the pelvis by the odor and appearance of the material aspirated.

Perineal phase With the abdomen closed the patient is placed in the lithotomy position and the rectum is wiped out and packed with

ited with 3 5 per cent tincture of h the surrounding parts carefully a midline incision is made through r border of the anus, sphincters, o the right side of the coccyx (Figs. e pelvis, where the gauze attached oid is felt. The rectum is divided th scissors just above the sphunc but well below the carcinoma, and lge is caught as it is divided by a nostatic forceps (Fig 4) With gen- upon these forceps, and guided by ntroduced in the midline, the lev re elevated and cut laterally from and the urethra and prostate or separated anteriorly when the lib- um and sigmoid are easily withdrawn d is held apart by lateral retractors 7) The withdrawn bowel is wrap- owel and placed over the pubis on en With a trowel holding the sig ion against the pubis (Fig 8) the ity is sponged dry and any bleeding ligated The perineal wound is rela- scular and no ligatures may be re- the levatores ani are united in the 1 layers with No 31 gauge stainless interrupted sutures *without constric* e bowel (Figs 8 9) Otherwise, the swelling may strangulate the with- moid Omentum should not be trim- the bowel as they contain nutrient sels and occasionally a diverticulum.

The skin and fat are closed with fine (No 35 gauge) interrupted wire sutures (Fig 10) Af- ter the perineum has been closed it should be possible readily to introduce the finger between the bowel and sutured pelvic floor (Fig 11) Dressings are applied and the bowel is incised about 6 centimeters distant from the skin a No. 28 F rectal tube is inserted, and securely tied in with two encircling ligatures, and the rest of the bowel is cut away (Fig 12) A retention catheter is fastened in the bladder for the first 3 to 6 days, to be irrigated with boric or other solution daily It will be ob- served that the perineal floor is closed without drainage. With this technique less than 4 per cent have developed a perineal infection This is attributed to the iodine sterilization of the rectum and the exclusive use of stainless wire sutures and ligatures in this region As the withdrawn sigmoid is surrounded by a vascu- lar tube of anus and muscular pelvic floor to a depth of 5 to 7 centimeters, it is evident that the withdrawn bowel may slough back into the pelvic floor for several centimeters with- out ill effect. If there is question as to the sterility of the pelvic wound, a curved perfor- ated glass or metal drain or a large cigarette drain is to be inserted through the perineum to the anterior surface of the sacrum. With evi- dence of limited malignant invasion of the prostate or vagina, these should be resected. With irremovable extension into the base of the bladder and pelvic floor we have formed

Showing viable protruding sigmoid and primary cysts after operation. (Mr A., aged 6 years, out 75 after operation.)

Removal of redundant sigmoid centimeters skin, without anesthesia, with tonsil snare. aged 6 years, obstructive benign papillary of the rectum, metastatic carcinoma of pelvic and organs.)

Retraction of end of sigmoid immediately after op. (Mr B.)

Redundant sigmoid 3 days after abdominoperi- ton. (Mr C., aged 60 years, mucobemorrhagic 5 months. Partial obstruction for period of sev- eral months.)

Invasion of base of bladder prostate and adja- cent organs.)

Bulky redundant sigmoid from obesity 3 days after abdominoperitoneal resection. (Mrs. D. aged 62 years, 1 polyp removed from rectum 5 years previ- ous to operation. Barium roentgenograms neg- ative.)

Abdominal scar 7 days after abdominoperitoneal. Steel less steel stump drain used the first 4 days after operation. Good condition 23 months after

operation. Enema every 3 days. N anal protection re- quired.)

Fig. 9. One month after operation. (Mr F. aged 56 years. Mucosa for year treated by hemorrhoidal in- jections. Excellent condition, good defecation sense, uses enema every 3 days, rarely solids.)

Fig. 10. Seven months after operation. (Mr H., aged 60 years. Uses laxative once a week. N pad is required, no soiling.)

Fig. 11. Thirty-two months after operation. (Mrs. L., aged 25 years. Good control, good defecation sense, no soiling.)

Fig. 12. Three years after operation. (Mrs. J. aged 30 years. No pad required.)

Fig. 13. Five years after early type of author's ab- dominoperitoneal resection and secondary anal plastic opera- tion. (Mr K., aged 68 years. Good control with enema every 4 days. Slight anal moisture from exposed mucosa, for which a scrap of cotton is worn without pad or belt.)

Fig. 14. Seventeen years after perineal anoproctectomy and secondary plastic operation. (Mr L., aged 56 years. Evacuation after each meal. Good warning and control. No pad required.)

the anal outlet as described with satisfactory palliation (Fig 16)

About 6 days after the operation the rectal tube will slough out of the bowel as a rule leaving a length of living bowel protruding from the anus (Figs 13, 16 17) Two to 6 days later, provided the perineal wound is well united, the redundant or protruding bowel is snared or burned off 1 or 2 centimeters beyond the skin by means of a heavy tonsil snare (Figs 14 15) or a clamp and galvanocautery. No anesthetic is required for this division as the bowel is insensitive. All bleeding should be controlled when the bowel is divided. The protruding end of the sigmoid soon spontaneously retracts and disappears within the anus, to unite with the edge of the anal mucosa just above the sphincters. If hemostasis is imperfect, bowel divided too close to the skin may retract too high and bleed back into the colon with exsanguination and no telltale escape of blood from the anus.

Seven to 9 days after the operation the patient is permitted to be out of bed and often will be in condition to leave the hospital on the eleventh to fourteenth day. At this time he will be able to contract his sphincters voluntarily and usually will have acquired a defecation sense. As a rule he will not be able to retain liquid or semiliquid sigmoid contents and should be instructed to take a quickly acting laxative such as sodium sulfate 8 grams in water 120 cubic centimeters, every second to fourth day, on arising. After 2 months (Figs 18 19) an enema or colonic irrigation may be substituted for the laxatives, used at intervals of from 2 to 5 days as determined by the personal habits of the patient. Except during periods of watery diarrhea, most patients then have little or no soiling and can dispense with a protective pad most or all of the time. The narrow annular scar uniting the sigmoid to the anal mucosa should be dilated frequently if it tends to contract. The patient may be given a set of test tubes or other dilators to be inserted daily after complete healing has occurred or instructed to insert a gloved finger until a permanent adequate opening has been established. A strictured opening will prevent complete evacuation and lead to colic and annoying dribbling. Eventually satisfactory

evacuation habits may be established for many patients without artificial aid or by the daily use of one or two teaspoonfuls of one of the bulk producing mucilaginous powders (metamucil, mucilose, kentos) derived from one of the varieties of plantain seed or other vegetable. Such powders are to be quickly stirred in a glass of cold water and drunk on retiring or arising. Other patients prefer an enema or quickly acting mild saline taken every 2 to 5 days. Even when cancerous invasion of the anus has made it necessary to remove the sphincters (Fig 24), the foregoing measures will render the perineal colostomy preferable to an abdominal colostomy provided an opening of sufficient caliber is maintained and the more troublesome laxative foods are eliminated from the diet.

It should be noted that the operation except for the removal of redundant bowel is performed in one stage, that no attempt is made to peritonealize the denuded pelvis that the sphincters are not denuded of their mucous membrane covering that the sigmoid withdrawn through the anus or pelvic floor is *not sutured* to the skin or other structures nor is the projecting portion cut away until at least 7 days have elapsed. Rhythmic longitudinal contractions continue in the withdrawn bowel causing holes or small contaminating fistulas if sutures are introduced and early and undesirable retraction when the bowel is cut flush with the skin. Minor modifications of the operation may be found desirable. Formerly I used a fairly large perforated glass or rustless steel tubular drain in the perineum instead of an abdominal sump but an occasional serious perineal infection occurred attributed to the open drained wound in an area difficult to protect adequately from soiling. For those inexperienced or who use catgut in the perineum I would advise pelvic drainage by tube or a large cigarette drain. My colleague Dr H E Bacon divides the anal mucosa close to the skin margin and dissects it from the sphincters. This procedure enables the denuded sphincters to be stretched sufficiently for the withdrawal of the rectosigmoid and a week or more later when the protruding bowel is trimmed back he sutures the margins to the skin edges with catgut. Unless the sphinc

The Paul Mikulicz operation particularly for the rectosigmoid is insufficiently radical, has a higher operative mortality,¹ a greater morbidity, and the highest incidence of recurrence in the abdominal wall adjacent bowel and mesentery, and of secondary hernia. However, if the bowel ruptures or is perforated, it provides the quickest way to terminate the operation. I have not used this method or its modifications in the last 3 years.

For some years I have been practicing radical excision without colostomy for inoperable carcinoma of the large bowel. In this way a considerable proportion of patients with inoperable carcinomas have had the primary growth removed and have lived longer and more comfortably than if a palliative colostomy had been done. Of the last 300 patients seen only 3 per cent were considered to have disease too far advanced for palliative resection. Several had had a colostomy which also was eliminated. About 20 per cent had secondary palpable growths in the liver and 13 per cent had extension of the cancer to other abdominal organs, yet most of these patients, after radical resection with primary wound closure, lived from 7 months to several years in improved health.

Hospital mortality. In a personal experience of 617 radical operations for cancer of the large intestine the mortality has markedly decreased with experience, improvements in technique, and the routine use of antibiotics. Of the last 300 patients entering my service, 97 per cent (aged from 21 to 87 years) have had radical intestinal resection. A number of these had a previous colostomy without extirpation of the cancer. Three per cent had disease so advanced that even a palliative operation was

considered of no advantage. Ninety seven per cent, about one-third with advanced and inoperable malignancy, had a radical resection of the cancerous bowel, with a hospital mortality of 9 per cent. However, in the series there were 66 consecutive radical operations with 1 death, and in a rather recent series of 100 admissions for carcinoma of the large bowel, 2 were found to have disease too extensive for resection or colostomy, with 1 hospital death. Ninety-eight had radical resection, including 18 with palpable metastatic carcinoma of the liver and 13 with cancerous invasion beyond the bowel. Three with carcinoma of the anus had perineal resection with perineal colostomy, without mortality. Forty four had the abdominoperineal operation with retained anus, with 2 hospital deaths (1 with advanced carcinoma of the liver), a mortality of 4.5 per cent. 51 had one stage, abdominal, aseptic, end-to-end resections with 2 hospital deaths (3.9 per cent), 1 from coronary occlusion, 1 from peritonitis. Sixteen of these 51 end-to-end resections were for cancer of the rectum, 22 for cancer of the sigmoid or descending colon and 13 for cancer of the right or transverse colon.

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¹Twelve per cent (personal series); "approximately per cent" in over 450 cases, Lahey Clinic (5).

GNOSIS IN CARCINOMA OF THE COLON AND RECTUM

A 10 Year Follow Up of 337 Patients

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Is a well known but occasionally forgotten fact that the term "five year cure" is little more than a convenient yardstick when used in connection with patients ring from malignant disease. It will give approximate idea of the end-results in a p of patients with malignant disease in site or another but it cannot be applied to individual patient. Some of these people who have survived 5 years following the oval of their cancer will ultimately die of r original disease. This is true of carcinoma of the colon and rectum just as it is of anoma of the breast and other viscera. It f interest and of value to know the results these patients with carcinoma of the colon l rectum 5 years after operation and what chances are for an individual patient with malignant lesion to live not only 5 years t 10 or more years following resection of the dignant tumor.

In 1929, Jones reported a 22.7 per cent mortality in a series of 204 cases of carcinoma of rectum in which the patients were treated abdominoperineal resection. Seventy per nt of the patients who survived operation re alive and well at the end of 3 years and 3 per cent were living 5 years after their eration. His operability or resectability te was 53 per cent.

Miles, in 1931 followed a group of 94 patients who had survived abdominoperineal rection for carcinoma of the rectum, and found 9 alive and well at the end of 5 years. This is a 5 year nonrecurrence rate of 73.3 per cent.

Abel in 1935 found a 69.2 per cent survival ate in 150 patients whose course was followed or 5 years following abdominoperineal resec on for carcinoma of the rectum. These figures are somewhat higher than those found in his country.

In 1933 Rankin in a follow up of 300 patients who had had resection for carcinoma of

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the rectum, found a 5 year survival rate of 48 per cent in those patients who showed no metastasis to lymph nodes in the resected specimen. In the group of patients in whom the lymph nodes were involved 20 per cent survived 5 years. In 187 cases of carcinoma of the right colon Rankin and Olson obtained 5 year cures in 39 per cent of their patients with nodal involvement, and in 66 per cent of those without nodal involvement. In 266 cases of carcinoma of the left colon their figures were 29 per cent and 56 per cent, respectively.

In 1943 Cattell found 53.6 per cent of 140 patients who had survived resection for carcinoma of the colon or rectum were living 5 years or more after operation. This figure was based on all patients submitted to resection and included palliative operations and unfavorable resections as well as favorable cases. It is of great value to know the operability or resectability rate in evaluating statistics relating to end results, for in any group of cases if the patients with unfavorable lesions are not submitted to resection the survival rates naturally will be higher. The operability rate in this group of patients was 83.5 per cent.

In 1943 Mayo and Twyman followed 79 cases of carcinoma of the rectum and found that 70.9 per cent of the patients with favorable lesions and 45.5 per cent of those with unfavorable lesions were alive and well 3 years after operation. In 1945 Hayden in reviewing 198 patients with carcinoma of the rectum who were submitted to resection found a 5 year cure rate of 33 per cent among the 98 patients whose course was followed for 5 years or more. His resectability rate was 80.6 per cent for all patients seen and 88.0 per cent for the group who came to operation.

The spread of carcinoma of the colon or rectum through the adjacent lymphatics has long been understood. For many years we have routinely isolated and examined the mes-

entent lymph nodes in each resected specimen for the presence of metastatic carcinoma. The significance of nodal involvement to the prognosis in the individual case is apparent from the present study and from the cases reported in the literature. Only in recent years however has the frequency with which carcinoma of the colon and rectum may spread through the vascular system been fully appreciated. Any discussion of prognosis following resection for carcinoma of the colon and rectum should emphasize the seriousness of blood vessel invasion as seen in the microscopic examination of the resected specimen. In one study of 208 patients we found that of those patients who had shown blood vessel invasion at the time of operation only 15 per cent were alive 5 years later.

In the present study the case histories of 337 patients with carcinoma of the colon and rectum were carefully reviewed. All were treated prior to 1936 and 307 of these patients have been followed for at least 10 years.

The patients were divided into two main groups. In the first group were those with carcinoma of the colon including carcinoma of the cecum ascending transverse descending and upper sigmoid colon. The second group consisted of patients with carcinoma of the lower sigmoid rectosigmoid and rectum since in these cases some type of resection of the rectum and rectosigmoid with the establishment of a proximal colostomy, was carried out.

CARCINOMA OF THE COLON

There were 103 patients with carcinoma of the colon. The youngest patient was 27 years of age the oldest 74 and the average age was 57 years. The incidence of carcinoma of the colon was slightly higher in women (56) than in men (47) whereas the reverse was true for carcinoma of the rectum.

Eighty-one of the 103 patients were submitted to some type of resection including 14 palliative resections. This is a resectability or operability rate of 78.6 per cent. Three of the palliative resections were definitely so because of the presence of liver metastases at the time of operation and 11 others were considered so because of local invasion at the time of resection. There were 22 patients in whom resec-

tion was not considered feasible. Three patients were not operated on, 4 had laparotomy only, 2 had cecostomy and 13 had a side tracking anastomosis such as an ileotransverse colostomy or colocolostomy.

A modified Mikulicz type of resection was done in 76, or 94 per cent of the patients submitted to resection. A two stage resection consisting of a preliminary anastomosis followed by resection subsequently was done in 4 and a one stage resection with primary anastomosis was performed in 1 case. A tendency toward a one stage procedure for resection of carcinoma of the right colon is shown by the comparison of these figures with those for 1945 when a one stage procedure with primary anastomosis was carried out in 17 per cent of patients with carcinoma of the cecum ascending colon and hepatic flexure. In the remainder a modified Mikulicz type of resection which we still prefer for carcinoma of the left colon, was performed. The modified Mikulicz procedure has two distinct advantages over other two stage procedures. In the first place it removes the growth at the primary operation and at the same time avoids an intraperitoneal anastomosis, and in the second place the second stage is an extraperitoneal type of procedure.

Mortality Five deaths occurred in the group of patients in whom the malignant tumor was limited to the bowel wall. Eight deaths occurred in the group in which the carcinoma already had invaded either the adjacent lymph nodes or neighboring viscera. This is a mortality of 16.0 per cent in the resected cases. In line with the marked reduction of the mortality noticed in all surgical centers interested in the treatment of carcinoma of the colon it may be noted that the mortality in this group of patients in 1945 was 2.3 per cent. This has been accomplished in spite of the fact that the operability rate has continued to rise and in 1945 was 90.7 per cent. Three deaths occurred among those patients in whom only laparotomy or a palliative anastomosis was possible.

Follow-up In the group in which the regional lymph nodes and adjacent viscera were not involved there were 38 patients in whom the 10 year follow up was complete. Of this group 5 patients died in the hospital 5 other

TABLE I—CARCINOMA OF COLON

Type of operation	Hospital deaths	Patients dying of carcinoma following operation							Living and well 10 or more years	Deaths from other causes	Total
		1-6 mos.	6-12 mos.	1-18 mos.	18-24 mos.	24-36 mos.	3-5 years	5-10 years			
Laparotomy only											4
Decolectomy or colectomy		6	5								11
Resection; liver metastases present								1*			
Resection; liver negative; metastases in lymph nodes	8			3	3	3			2		27
Resection; liver negative; lymph nodes negative	5						4		16	5	34
Sarcoma											

*Nodules noted in liver at time of operation; biopsy not done and may not have been metastases.

patients subsequently died from causes other than recurrences of the carcinoma. These patients had lived from 3 months to 8 years following operation with no evidence of recurrence at the time of death from other causes.¹ Of the remaining 28 patients, 18 were living and well at the end of 5 years, 2 died of recurrent malignant disease between their fifth and tenth postoperative years, and 16 were living and well 10 or more years following resection of their malignant lesion. In 12 additional cases the 10 year follow up was incomplete although 6 of these 12 patients are known to have been living and well 5 or more years after operation. Thus, in the group of patients who survived operation and in whom the 10 year follow-up is complete, the 5 year survival rate is 64.3 per cent and the 10 year survival rate is 57.1 per cent.

Of the 27 patients in whom the malignant disease had extended to the adjacent lymph nodes or involved the surrounding structures, 8 died in the hospital and 15 died of recurrence of their disease within 5 years (Table I). One patient died of a recurrent carcinoma after having survived 5 years and 3 patients are living and well 10 or more years after operation. Thus, for this unfavorable group the 5 year survival rate has dropped to 14.8 per cent and the 10 year survival rate to 11.1 per cent. One patient with sarcoma of the colon

died less than 18 months after operation from recurrence of his malignant disease. Four patients in whom resection was done in the presence of liver metastases lived from 1 to 5 years following operation. In the one case in which the patient survived more than 3 years, there is some question as to whether the nodules noted in the liver at the time of operation were actually metastases, since no biopsy specimen was obtained. Of the 4 cases in which laparotomy only was performed, not 1 patient survived a year. The same was true for the 13 patients in whom only a sidetracking anastomosis was carried out.

CARCINOMA OF THE RECTUM AND RECTOSIGMOID

There were 234 patients with carcinoma of the rectum and rectosigmoid. Of these 129 were males and 105 were females. Their ages ranged from 21 to 75 years, with an average age of 57 years. It is worth while to note again that carcinoma of the rectum is found not uncommonly in patients under the so-called cancer age. Nineteen patients or 8 per cent of the entire group were under 40 years of age.

Procedure. One hundred forty-six patients, or 62 per cent of this group were submitted to some type of resection. A two stage Lahey procedure was performed in 83 or 56.8 per cent of the 146 patients, a one stage abdominoperineal (Miles) resection in 24 or 16.4 per cent, a posterior resection in 22 or 15.0 per cent, and an anterior resection (with permanent colostomy) in 17 or 11.6 per cent. Eighteen of these resections were considered palliative. 11

¹Since these figures are being examined from the point of view of recurrence or nonrecurrence of carcinoma of the colon and since those patients who die from other causes represent an unknown quantity in this respect, it seems reasonable that they should be excluded in the final analysis. It is important, however, to know the number of these patients and the length of time after operation when death occurred. A patient should be excluded who was not free of all evidence of recurrence at the time of death.

TABLE II—CARCINOMA OF RECTUM AND RECTOSIGMOID

Type of operation	Hospital deaths	Patients dying of carcinoma following operation							Living and well 10 or more years	Deaths from other causes	Total
		<6 mos.	6-12 mos.	13-18 mos.	19-24 mos.	25-36 mos.	3-5 years	5-10 years			
Laparotomy only		7	1								9
Colostomy only	10	11	15		1	1	1				61
Resection liver metastases present			1	1							
Resection liver negative lymph nodes involved	5		6		0	3	7	3		4	3
Resection, liver negative lymph nodes negative	6		3	1		2		5	31	7	73
Sarcoma											

definitely so because of the presence of liver metastases and 7 probably so because of invasion of adjacent structures. A steady tendency toward the increasing use of the one stage Miles abdominoperineal resection is shown by the fact that this procedure was used in 16.4 per cent of the above group, 76.7 per cent in the year 1941, and 97.5 per cent in 1945. Resection was not carried out in 88 cases, a colostomy having been done in 62, a first stage Lahey procedure in 10, and a laparotomy only in 11. No operation was performed in 5 cases.

Mortality. Of the 146 patients who were submitted to resection, including 18 palliative resections, there were 11 deaths, or a mortality for the resected cases of 7.5 per cent. Since 1936 the operative mortality for carcinoma of the rectum has dropped to 3.8 per cent in 1941 and 6.2 per cent in 1945. At the same time the operability rate has increased from 62 per cent to 83 per cent.

Twenty-eight deaths occurred in the group of patients whose growths were so extensive that only laparotomy or colostomy was possible.

Follow-up (Table II). In the group of 73 patients in whom there was no evidence of involvement of the liver or lymph nodes at the time of resection, 31 patients are known to be living and well 10 or more years following their operation. At the end of 5 years following operation, 36 patients were living and well without evidence of recurrence. Five patients died from recurrence of the carcinoma between their fifth and tenth postoperative years. Twenty-four patients died from recur-

rent carcinoma in from 1 month to 5 years following operation. Seven patients subsequently died from other causes, with no evidence of recurrence at the time of their death. (5 of these 7 patients had survived without recurrence 4½ to 7 years after their resection.) There were 6 postoperative or hospital deaths. The 1 patient with sarcoma of the rectum died from recurrent malignant disease less than 18 months after his operation. Omitting the 6 postoperative deaths and the 7 patients who died from causes other than the recurrence of their carcinoma, the 5 year survival rate is 60 per cent and the 10 year survival rate is 51.6 per cent.

In 52 cases no metastases were noted in the liver at operation, but the carcinoma was found to have spread to the mesenteric lymph nodes on examination of the resected specimen. Of this group, 10 patients are living and well 10 or more years following their operation. Three patients died from a recurrence of their malignant disease between their fifth and their tenth postoperative years. There were 5 postoperative deaths and 4 other patients subsequently died from other causes with no evidence of recurrence at the time of their death. Omitting the postoperative deaths and the patients who died from other causes than malignant disease, the 5 year survival rate is 30.2 per cent and the 10 year survival rate is 23.2 per cent.

In the entire group, 28 patients died of their disease within 6 months of operation. Of these, 25 or over 89 per cent occurred in the group in whom only laparotomy or colostomy was possible. Thirty patients died of the

TABLE III.—CARCINOMA OF COLON

Group	Percentage of patients living and well for 5 years	Percentage of patients living and well for 10 years
Unfavorable (lymph nodes involved and local invasion)	3	
Favorable (lymph nodes not involved)	64.3	57.4

TABLE IV.—CARCINOMA OF RECTUM AND RECTOSIGMOID

Group	Percentage of patients living and well for 5 years	Percentage of patients living and well for 10 years
Unfavorable (lymph nodes involved and local invasion)	30	23
Favorable (lymph nodes not involved)	66	51.5

disease in 6 to 12 months after operation. In 16 or 53.3 per cent resection was not possible, and in an additional 16.6 per cent liver metastases had been noted at the time of the palliative resection. Although there was no difference in the length of survival of patients who had resection of their growth in the presence of liver metastases and those who had colostomy only (only 1 patient in each group lived more than 3 years) there was a marked difference in the postoperative clinical course. Those patients in whom the rectal lesion was left *in situ* were usually very uncomfortable from the constant discharge of mucus and blood from the rectum, and they often had severe pain from sciatic and perineal nerve involvement. Those patients in whom the primary growth was removed were usually comfortable until within a few weeks of their death.

Of the 15 patients in whom the 10 year follow up was incomplete and who were not included in the above analysis 6 patients had had such advanced disease that only a laparotomy or colostomy was possible at the time of operation. Three other patients had resection in the presence of metastasis to adjacent lymph nodes or local extension of the growth.

Thus, of the resected cases not known definitely to be palliative or unfavorable only 6 were not followed for 10 years and 5 of these are known to have been living without recurrence 6 to 8 years after operation.

SUMMARY

The case histories of 81 patients who had resection for carcinoma of the colon 10 or more years ago were carefully reviewed. Of the patients with favorable lesions that is those in whom the adjacent lymph nodes were not involved and there was no local invasion of the surrounding tissues, 64.3 per cent survived 5 years without recurrence and 57.1 per cent are living and well without recurrence 10 or more years following resection of their malignant tumor.

Of the patients with unfavorable lesions, that is those in whom the lymph nodes showed evidence of metastases or there was invasion of the surrounding structures by the tumor 15 per cent were living and well 5 years

after operation. Eleven per cent are living and well 10 or more years following resection (Table III).

The histories of 146 patients who had had a radical resection for carcinoma of the rectum or rectosigmoid 10 or more years ago were also reviewed.

In the favorable group (adjacent lymph nodes negative for carcinoma, no local invasion) 60 per cent were found to be well with out recurrence at the end of 5 years; at the end of 10 years this figure had dropped to 51.6 per cent.

In the less favorable group (lymph nodes showing metastatic carcinoma or invasion of the surrounding tissues by carcinoma) 30.2 per cent survived 5 years without a recurrence. Only 23.2 per cent are living and well ten or more years following their operation (Table IV).

Of the patients who died from malignant disease between the fifth and tenth postoperative years the majority died between 5½ and 6½ years following operation. Two patients lived 7 years and one 8 years. All of these patients gradually failed and died with the signs and symptoms of carcinomatosis of the abdominal cavity. Nevertheless, the possibility exists that some in this group may have succumbed to a second undetected primary lesion arising in the gastrointestinal tract and not as the result of a recurrence of their resected lesion.

COLCOCK PROGNOSIS IN CARCINOMA OF COLON AND RECTUM

CONCLUSIONS

These figures suggest that in a patient with carcinoma of the rectum in whom the mesenteric lymph nodes of the resected specimens show no evidence of carcinoma, the prognosis is approximately twice as favorable as it is for a patient in whom the lymph nodes are positive. The unfavorable significance of positive lymph nodes in carcinoma of the colon appears even greater.

The figures also suggest that, although some patients who are living 5 years after resection for carcinoma of the colon or rectum will ultimately die of their disease, more than 50 per

cent of those who survive this operation in whom the mesenteric lymph nodes are negative for carcinoma may expect a permanent 'cure' of their malignant disease from cal surgical resection.

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CONGENITAL ATRESIA OF INTESTINE AND COLON

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THE outlook for newborn infants with congenital atresia of the bowel is not as black as it was 20 years ago. Up to that time a postoperative recovery was of sufficient rarity to be worthy of publication. Because of persistent work by those interested in children's surgery—Ladd and Gross, Miller, Donovan, Duckett, Webb and Wangenstein and others, the mortality figures are constantly improving. The infant who does not come to surgery until the intestines have ruptured and produced a full-blown peritonitis has little or no chance of survival. Likewise, the infant with multiple anomalies of the bowel or severe associated congenital malformations has a very slim chance of surviving surgery. The prognosis is good, however, for a full-term infant who is normal except for atresia of the bowel and who is operated upon the third or fourth day of life. Earlier diagnosis, chemotherapy and use of more appropriate suture material have contributed to a higher percentage of recoveries.

During the past 6 months, 5 patients with congenital atresia of the bowel have come under my care and have been operated upon: 1 of the duodenum, 3 of the ileum and 1 of the colon. There was 1 death.

DIAGNOSIS

Little difficulty would be experienced in making a diagnosis if congenital atresia of the bowel were more common. However, many physicians in general practice never encounter this condition in a lifetime of active practice. Even in the practice of a busy pediatrician few of these patients are seen. It is entirely probable that the diagnosis is not made until the symptoms of intestinal obstruction present themselves.

Vomiting is the outstanding early symptom. It begins the first or second day after birth, depending upon the level of obstruction and is

persistent. By the third day of life the vomitus is greenish brown and has a foul odor. The majority of atresias are below the ampulla of Vater and the vomitus contains bile. In Case 1 of this series the obstruction was above the ampulla.

Distention varies with the level of obstruction. In Case 4 of an infant with atresia of the colon there was tremendous distention where as the infant with atresia of the duodenum after deflation of the stomach had a scaphoid abdomen. Gastric peristaltic waves passing from left to right are seen in babies with duodenal atresia. Intestinal patterning is easily visible in patients with lower obstructions.

The difference in the stool of an infant with atresia of the bowel and that of a normal infant is recognizable but not impressive. It is light green, very small in amount and contains mucus in contrast to the tarry appearance of a normal meconium stool. Farber's test is of value if uncertainty exists.

Röntgenologic examination is of great help in establishing the diagnosis (Figs. 2, 3, 4, 5, and 6). The roentgenogram should be made with the infant in the upright rather than the supine position. If obstruction is present, widely distended loops of bowel showing fluid levels will be seen. Furthermore, the x-ray film will indicate whether the obstruction is high or low. Positive differentiation of duodenal, ileal or colonic obstruction is impossible because of the enormous dilatations seen and because these loops crowd one another into abnormal positions. The administration of barium to these babies is condemned. Its use is unnecessary to make a diagnosis of obstruction; it clogs the intestine and if aspirated tends to produce pneumonia.

A general physical examination is important primarily as a search for other abnormalities. A rectal examination is in order to determine patency.

PREOPERATIVE CARE

Parenteral fluid is essential for these infants who usually are admitted in a state of

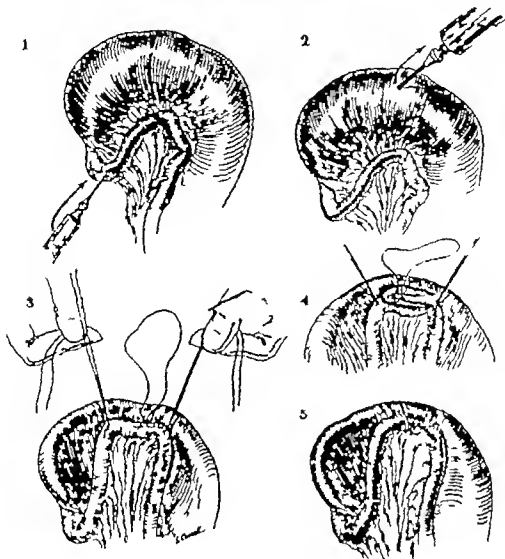


Fig 1 Operative technique (see text)

moderate dehydration. Fluids can be given most satisfactorily by the intravenous route with a cannula in the saphenous vein at the ankle. A "cut down" is always necessary for insertion of the cannula. Administration of fluid by "marrow infusion" with a Tocantini needle may be used but is inferior to the intravenous method. Isotonic solution of saline 10 to 15 cubic centimeters per pound of body weight each 24 hours is sufficient. Dextrose solutions in 5 to 10 per cent concentrations should be used to bring the total fluid intake for 24 hours up to 50 to 75 cubic centimeters per pound of body weight. The fluid is begun preoperatively and continued postoperatively. Small blood transfusions 50 to 75 cubic centimeters and plasma are used as indicated.

The stomach must be completely emptied before operation. A No. 10 F catheter is in-

serted into the stomach through the nose and all fluid removed by suction with a syringe. If this material in the stomach is thick, or if the infant has been given barium, lavage may be necessary with a measured amount of water all of which is removed. The catheter is left in place during operation and postoperatively attached to a Wangenstein suction apparatus.

OPERATION

Drop ether with an open mask is most satisfactory. A longitudinal right rectus muscle splitting incision is made sufficiently long to allow for adequate exposure. The greatly distended loops of bowel are allowed to escape from the abdominal cavity. There will be far less trauma to the fragile bowel wall if it is allowed to protrude as it will and is covered with moist packs.

SURGERY GYNECOLOGY AND OBSTETRICS

The collapsed undeveloped bowel distal to the obstruction is ordinarily the size of an old fashioned slate pencil (Fig 5). It is followed downward in a quick search for other points of atresia. Then with a fine hypodermic needle salt solution is injected into its lumen just beyond the site of atresia to demonstrate other points of obstruction that may have been overlooked. If the fluid can be followed to the rectosigmoid patency has been demonstrated. A large caliber needle attached to a 50 cubic centimeter syringe is inserted into the distended bowel at a point where the incision is to be made later for the anastomosis. The introduction of the air and meconium allows the thin bowel wall to collapse, makes the anastomosis easier and lessens the danger of leakage through needle punctures.

A side-to-side anastomosis is done between the proximal and distal loops (Fig 1). Whether the anastomosis is made isoperistaltic or anti-peristaltic seems to make little difference. The loops of bowel are apposed by two interrupted stitches of silk one at each end of the site of the proposed anastomosis. These sutures are used to steady the loops of bowel while serosa is sewed to serosa with a continuous over and over silk stitch. No 00000 Deknatel braided silk on a curved No 9 atraumatic needle is the suture material of choice. The fact that the swaged-on needle is very fine, almost the same size as the silk, minimizes the danger of suture leakage. A fairly long cut is made in each loop of bowel. Mucosa is sewed to mucosa with the running over and over stitch on an atraumatic or No 00000 chromic catgut on an atraumatic needle. It is judicious to take small bites of bowel wall in each stitch lest the lumen be encroached upon. It is my feeling that a running over and over suture carefully placed gives a better seal than interrupted stitches and that it interferes less with the mattress suture. A second interrupted silk stitch at each angle re-enforces and completes the anastomosis. The opening in the mesentery is closed by multiple atresias exist the intervening segments may or may not be resected depending upon the condition of the patient. If left they will eventually produce sausage-shaped cysts requiring removal.

Usually a transfusion of 40 to 60 cubic centimeters of citrated blood is given during the operation.

The operative wound in each instance is closed with No 000 chromic catgut for the peritoneum and posterior sheath of the rectus. The anterior sheath of the rectus is closed with interrupted No 0000 Deknatel silk sutures.

POSTOPERATIVE CARE

Upon return to the crib the infant is given 50 000 units of penicillin followed by 10 000 units every 3 hours thereafter. A Wangenstein suction apparatus is attached to the catheter in the stomach immediately after operation and suction continued for 48 hours. Every 4 to 6 hours the catheter is irrigated with a medicine dropper to be sure that suction is being maintained. The necessary amounts and types of fluid are continued intravenously. On the third postoperative day the catheter and suction apparatus are removed and the routine postpyloric regimen of feeding is begun. It is very important to underdo rather than press the amounts of food given. In Case 2 overfeeding necessitated resumption of gastric suction for 48 hours. By the seventh to fourteenth day if all goes well the infant is usually on a maintenance diet.

CASE REPORTS

CASE 1. J. B., a baby girl, was born May 26, and referred to The Children's Memorial Hospital by Dr. Edna Mortimer, weighed 5 pounds 7 ounces at birth and 4 pounds 11 ounces upon admission. Physical examination revealed a tiny somewhat dehydrated infant with small mongoloid eyes deeply jaundiced. X-ray examination by the roentgenologist in the upright position showed two large fluid filled, Dr. Aspasch revealed. Films made with the patient in the upright position typical of high obstruction of the duodenum (Fig 2).

Operation. The stomach and first part of the duodenum proximal to the ampulla of Vater were greatly distended. The rest of the bowel was tiny and collapsed. Since the duodenum could easily be raised for its third portion could easily be raised for its third portion. This was accomplished by two rows of continuous silk sutures. Immediate postoperative condition was good. The second postoperative day continuous feedings were begun, well tolerated and retained. Normal bowel move-

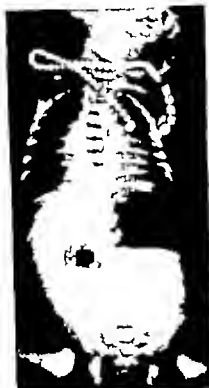


Fig. 2a.



Fig. 3.



Fig. 4.



Fig. 1b.



Fig. 5.

Fig. 2. Case 1 a, Anteroposterior upright roentgenogram showing air bubble in stomach and duodenum, b, lateral supine view. Typical findings in atresia of the duodenum.

Fig. 3. Case 2. Loops of dilated bowel typical of atresia of the small intestine.

Fig. 4. Case 3. Roentgenogram shows loops of dilated small bowel.

Fig. 5. Case 3. Characteristic findings at operation—single atresia of the ileum.

ments were passed. For 6 days the infant did well even gained a little weight and then died suddenly. Postmortem examination revealed no demonstrable cause of death. There was a patent foramen ovale, a few petechial hemorrhages in the lungs and some congestion of all the organs. The duodenoduodenotomy was intact and in the normal process of healing. The presumptive cause of death was suffocation.

CASE 2. K. M., a baby girl was born June 25 and referred to The Children's Memorial Hospital June 30 by Dr. Ina Harper of Benton Harbor, Michigan. The infant's weight at birth was 6 pounds 8 ounces, upon admission 5 pounds 11 ounces. She had vomited all feedings since birth and had passed no meconium. Her general condition was fair and a good state of

hydration had been maintained. Her abdomen was distended and intestinal patterning was visible. An x-ray film of the abdomen revealed distended loops of small bowel containing barium. Diagnosis was congenital atresia of the small bowel (Fig. 3).

Operation. An enormously dilated bluish purple but not gangrenous ileum was exposed. The obstruction was single about 6 inches proximal to the ileocecal valve. A side-to-side antiperistaltic anastomosis was done with two rows of continuous silk sutures.

The infant passed tarry meconium the first postoperative day. We disregarded our own advice to underfeed these infants. Abdominal distention and vomiting on the eleventh postoperative day necessitated the reinstitution of continuous gastric lavage.



Fig. 6. Case 4. Anteroposterior and lateral roentgenograms showing tremendous dilatation of the ascending colon.

and parenteral fluids for 48 hours. Feedings were then begun cautiously and were well retained. The infant was discharged in good condition on the twenty-second postoperative day.

CASE 3. F S, a baby boy was born August 1 and referred to The Children's Memorial Hospital August 3 by Dr. Eugene T. McEnery. His weight at birth was 6 pounds 5 ounces upon admission 6 pounds. The infant had vomited persistently since the second day after delivery. His general condition was good. The abdomen was distended and showed intestinal patterning. X-ray examination revealed distended loops of bowel with fluid levels (Fig. 4). Diagnosis was congenital atresia of the small bowel.

Operation. Single atresia of the ileum was found 1 inch above the ileocecal valve (Fig. 5). An isoperistaltic side-to-side anastomosis was done about the obstruction using No. 0000 silk on the serosa, and No. 0000 chromic gut on the mucosa. The child made an uneventful recovery and was discharged on the eighteenth postoperative day.

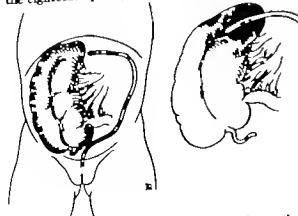


Fig. 7. Case 4. Diagrammatic illustration of operative findings in congenital atresia of the transverse colon.

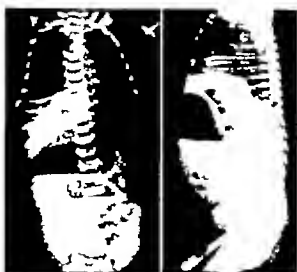


Fig. 8. Case 5. Anteroposterior and lateral roentgenograms showing huge dilatation of the small bowel in congenital atresia of the ileum.

CASE 4. B M, a baby girl, was born August 22, and was referred to The Children's Memorial Hospital August 25 by Dr. John A. Bigler. Her weight at birth was 7 pounds 8 ounces upon admission 6 pounds 5.00 oz. Persistent vomiting had begun 48 hours after delivery. Upon admission the abdomen was greatly distended and tympanitic. X-ray examination revealed a collection of air and barium containing fluid in the right half of the abdomen (Fig. 6). This was erroneously interpreted by us as a rupture of the bowel because it seemed impossible that dilatation to such size could occur without rupture. Preoperative diagnosis was congenital atresia of the ileum with rupture. Postoperative diagnosis was congenital atresia of the transverse colon without rupture.

Operation. When the abdomen was opened the unruptured, ascending colon delivered itself from the wound. Complete atresia of the transverse colon was found just beyond the hepatic flexure. The distal colon was patent. The ascending colon resembled a toy balloon, the transverse and descending colon a long angieworm. A side-to-side isoperistaltic anastomosis was performed.



Fig. 9. Case 5. Operative findings. The tip of the for ceps indicates the second point of atresia demonstrable only after injecting the bowel with salt solution.

stomosis was done using No 00000 silk throughout (Fig 7). The postoperative course was singularly smooth. On the nineteenth postoperative day a barium enema demonstrated that the lumen of the colon had enlarged considerably. The infant was discharged in good condition on the eighteenth postoperative day.

CASE 5 J P a girl was born October 13 and was referred to The Children's Memorial Hospital October 18 by Dr Anders J Weigen. She weighed 6 pounds 15 ounces at birth and 6 pounds 4 ounces upon admission. Vomiting had begun on the second day of life and persisted. The vomitus upon admission had a fecal odor. No bowel movement had been passed since birth. Hydration had been well maintained and the infant's general condition was surprisingly good. X-ray examination revealed an enormous dilatation of the small bowel (Fig 8).

First operation October 18 1946 Atresia of the ileum at approximately its midportion was found. Injection of salt solution into the ileum distal to the obstruction revealed a second atresia about 8 inches from the first (Fig 9). It had not been seen upon exploration. This 8 inch section of bowel was removed and the ends turned in with interrupted silk sutures. A side-to-side isoperistaltic anastomosis was done, using No 00000 silk for the serosa and No 0000 chromic catgut for the mucosa. During and immediately following the operation 75 cubic centimeters of citrated blood was given. Postoperatively the child did well for 9 days. Then distention and vomiting recurred and persisted in spite of continuous gastric aspiration.

Second operation November 1 1946 The previous incision was opened and a generalized subdiaphragmatic peritonitis was found. Large collections of yellowish turbid fluid were aspirated. The loops of bowel were plastered together with masses of plastic exudate. There was no odor. Exposure to the anastomosis did not seem justified because of the amount of trauma it would entail. The abdomen was closed without drainage. Streptomycin 50,000 units every 3 hours was started postoperatively along with 10,000 units of penicillin which the infant has been

receiving since the first operation. A number of bowel movements were passed and feeding again cautiously begun. For a week the infant did well. Distention recurred and again continuous aspiration of the stomach failed to relieve it.

Third operation November 15, 1946 The old incision was reopened but in spite of care a hole was made in the distended bowel adherent to the anterior abdominal wall. The hole in the bowel was closed with interrupted silk sutures. Exploration revealed obstruction cause undetermined, at the site of anastomosis. A side-to-side antiperistaltic anastomosis was made about the previous one and the abdomen closed. The third postoperative course was uneventful. Small feedings started on the third day following operation were retained and well tolerated. At the time of writing the infant is taking a generous diet and is gaining weight.

CONCLUSIONS

Earlier diagnosis chemotherapy proper suture material and physiological preoperative and postoperative care have improved the outlook for infants with congenital atresia of the bowel.

Five cases of atresia of the bowel with 1 death are reported.

Review of medical literature indicates that the patient with congenital atresia of the transverse colon included in this report is the first to survive surgery.

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DOUBLE CLEFTS OF THE LIP

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THE surgical repair of double cleft lips is about twice as difficult as in single clefts and the results are about half as good. Nevertheless, enough slow progress has been made to be worth recording and to note procedures or details to avoid

Normally the frontonasal process of the embryo fuses with the two lateral maxillary processes by the ninth week. When there is total lack of fusion of these on both sides, the three processes develop independently of each other from the ninth week until term with the result that the baby has not only a hiatus or cleft on either side, but also has severe growth distortions of the entire middle third of the face. Partial fusion on one side makes this distortion asymmetrical on the two sides and may render the interpretation and plan for repair even more difficult.

Many of the surgical principles and operative details outlined in previous papers on single cleft lips (1-2) are applicable in double clefts and will be referred to frequently. The double clefts however vary a great deal more in the amount and shape of the deformity so that more individual study and improvising is necessary in planning their repair. They are not considered surgically simply as two single clefts both of which happen to occur in the same patient.

AGE FOR PRIMARY OPERATION

The child with a double cleft lip has a very difficult feeding problem, produces much psychic shock to the parents and incites so many exclamations of curiosity and pity from others that an early closure is necessary (Figs. 1-6). It may be true that nicer closures could be obtained in some of these patients with less difficulty by waiting (Figs. 13-14) but the situation in general is almost intolerable for both the parents and the child. The operation is one of considerable magnitude though and

they are not closed as early as single clefts. A fairly satisfactory rule is to close them as soon as possible after the baby weighs 10 pounds subject to variations in the extent of the deformity and the child's general physical condition. Many of these patients have an anemia and are given transfusions to bring the preoperative hemoglobin up to 12 to 15 grams per cent. Nearly all of those with open palates will have a chronic otitis media which is not an especial contraindication to surgery. Operations are not done of course during an acute exacerbation.

Until the lip is closed feeding is done with a syringe (with a short piece of rubber tubing attached) and gavage is usually avoided.

TREATMENT OF THE PREMAXILLA

The premaxilla is the separate central segment of the upper jaw and is that portion arising from the embryonic frontonasal process. Briefly the problem of the premaxilla is that it is nearly always too far forward in the newborn baby but only with considerable effort can it be kept from being retruded too far backward in the adult. It varies a good deal in size, shape and position and at times as to the number of tooth buds it contains (Fig. 1). The large oval or almost rectangular premaxilla forms a better central segment of the jaw supports the lip better and will have the lateral incisor tooth buds inclined only slightly laterally so that it is easier to work with for both the surgeon and the orthodontist. It overlaps the lateral processes slightly on both sides, so that if it is necessary to set it back, it will rest as a bridge on them and will not tend to tilt and cannot sink back behind them. The small round premaxilla may be smaller than the hiatus between the two lateral processes, so that one must try to prevent it from being forced back between and behind them thus producing a retruded upper jaw and lip. The tooth buds are arranged in a partial circle around its periphery so that the lateral incisors

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Fig. 1. Partial double cleft shown just before operation (age 5 days) and at age of 3 years. Closed by plan marked in figure 9c. Good full vermilion obtained.



Fig. 2. Partial double cleft closed in same manner as in Figure 1. Note the amount of nostril rotation necessary on both sides. These clefts may be more difficult than total ones because they have less vermilion available for the repair.

may tend to grow directly into the lateral processes or even up into the nostril floors or forward through the lip if it becomes tilted. Some of the permanent tooth buds may be entirely missing from these tiny round premaxilla.

In the newborn baby the premaxilla is nearly always anterior to the lateral processes. It may be anywhere from just in front of them to extreme positions out on the tip of the nose where it may project forward and upward like a snout. In addition to forward displacement it may be tilted from side to side or rotated. If the cleft is partially fused on one side the premaxilla may be rotated toward that side but tilted so the open edge is farther forward.

It is not uncommon to find a bend or kink in the septum just behind the premaxilla, sometimes so marked as to occlude one or both

nasal airways at birth. This may be the result of intrauterine pressure on the premaxilla.

As a rule, the premaxilla is not disturbed or set back if the lip can be closed with it in its original position unless (a) it is badly tilted or rotated or (b) it is so far forward that the elastic pressure of the closed lip might bend the septum and occlude one or both nasal airways.

If the premaxilla is to be set back, it is set back the least possible amount necessary to allow successful closure of the lip. This is done by splitting the mucosa over the bottom of the vomer and resecting a block (submucously) of the vomer just back of the premaxilla. The premaxilla is set back until it is in contact with the vomer again and immobilized by a



Fig. 3. Partial double cleft with severe initial distortion. Repair was done by a plan somewhat similar to that in Figure 9b, except that a small rectangular flap (Fig. 12) was used on one side to make the lip equal in length clear across.



Fig. 4. Total cleft on one side and partial cleft on the other. The design for repair was the same as in Figure 3 but it was necessary to rotate the nostrils a good deal more to straighten the columella and obtain the nostril symmetry shown in the final result. The premaxilla was not moved, except by the elastic pressure of the closed lip.



Fig. 5. Initial condition and repair much the same as in Figure 4 except that the patient had a very tiny prolabium which stretched out considerably during the operation and grew still more full at the age of 1 year. Notice the absence of notches or whitening defect in these patients here all of the vermillion has been procured from the lateral segment.

wire suture through both fragments or better by nailing a straight Keith needle directly backward through the center of the premaxilla and on back through the center of the vomer (Fig. 8). In setting the premaxilla back an attempt is made to correct any rotation or tilting so that it will be centered with respect to the lateral processes as well as possible. This is insured somewhat by having excised a block rather than a wedge of the vomer.

When the premaxilla is larger than the space between the two lateral processes and good firm immobilization is obtained the lip can be closed during the same operation; otherwise the closure is done about 2 weeks later.

Bony union between the premaxilla and vomer is rarely obtained either way, but the fibrous union helps a good deal in keeping it centered.

THE DISPOSITION OF THE PROLABIUM

The prolabium is the central segment of the lip and must be used in this position in the closure. The upper part of it is sometimes advanced secondarily into the columella at 3 or 4 years of age (3) but it is best not to do this primarily.

Many plans of closure have included the vermillion of the prolabium in the vermillion of the reconstructed lip but these nearly always result in a double notch. This notching is not



Fig. 6. Total double cleft lip almost no columella and lip premaxilla projecting forward from tip of nose. Premaxilla set back and lip closed early. Lip and columella elongated at $3\frac{1}{4}$ years of age by method shown in Figure 5. Upper lip maintained in front of the lower one and patient has perfect speech following closure of palate at age of 8 months.

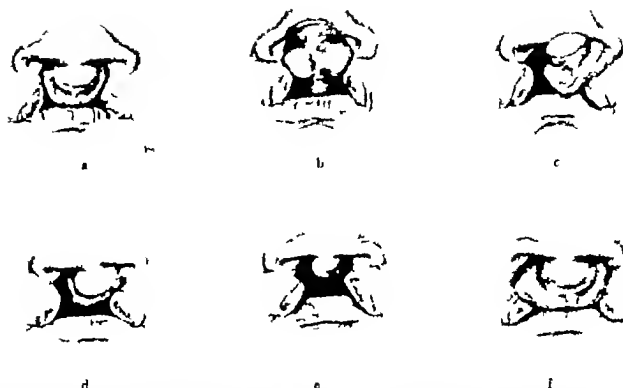


Fig. 7. Drawings of patients showing some variations in shape, size, and position of premaxillae. These variations preclude standardization in the closure of double cleft lips to the same extent as in singles. a and f can be closed without moving the premaxillae. b requires a preliminary setback of the premaxilla. c requires a preliminary rotation and "nailing" of it in the midline. In d the premaxilla can

be loosened slightly from the premaxilla and swung into the midline without moving the bone. a triangular or rectangular flap closure being used on the total side and a ∇ excision on the partial side. e The patient shown in this illustration will probably require closure with rectangular flaps from both sides to elongate the lip as shown in Figure 12.



Fig. 8. When the premaxilla is too far forward to permit closure of the lip, it may be set back by submucous excision of a block of bone from the vomer. This removal of a block, rather than a wedge, permits the pushing of it directly back like closing a drawer rather than tilting it back. This factor is of some advantage, as the finished lip should

slant forward. In the profile view from above downward. At right the premaxilla is being set back until it rests as a bridge on the two alveolar processes. It is anchored by means of a straight steel needle which is driven through the center and on back through the bony ridge at the bottom of the vomer.



Fig. 3. Design for closure of the three most common types:
a, Total double cleft lip; b, b, Mirault flaps are turned down from either side and united beneath the prolabium; c, A flap closure is done on the total side and a V excision operation on the partial side. Partial double cleft lip is less the same general manner as in but is good deal more difficult because of the attenuation of the vermillion. See text for detail of the method.

easy to eliminate by secondary procedures as it is due to an inherent thinning and upward direction of the vermillion on both sides of the prolabium.

Consideration of the cupid's bow configuration of some normal lips has somewhat confused this issue. The occurrence of the cupid's bow varies a good deal in normal lips and in any event it is an upward prolongation of the upper edge of the vermillion beneath each philtrum. The lower edge of the normal vermillion has a gradual downward curve from the center outward without any upward notches, and it is almost impossible to get this when the thin U-shaped vermillion of the prolabium is used as the central portion of the new lip.

It is thought best to use a plan in which an incision is made at the mucocutaneous junction all the way around the prolabium and its vermillion is turned back as a flap to be used for lining if necessary.

DESIGN FOR CLOSURE

Many of the features of the modified Mirault operation for single cleft lips (1-2) are used in

Fig. 4. An incision is made in the buccal fornix on either side and undermined is carried upward almost to the orbital borders until the cheeks have been separated from the underlying facial bones. The mucosal incision is then carried forward to the nostril between the upper lateral and alar cartilages, and the skin is separated from the alar cartilages with small scissors. The latter maneuver allows the skin to slide on the cartilage and the nostril to be rolled into tube without corrugation.



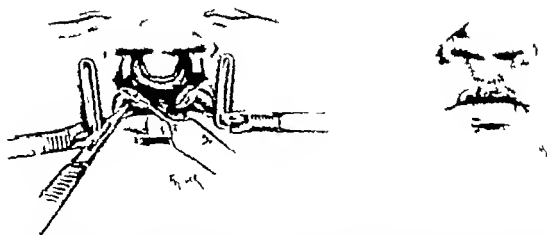


Fig. 11. a) Left, Crile clamps are placed to prevent bleeding and both sides of the lip are opened up going completely through the lip with a stab blade knife and using a perpendicular sawing motion. Any skin remnants are sliced off of the vermilion flaps. The vermilion of the prolabium is cut loose from the skin and turned back all around. b) The closure is done with many fine silk sutures, put in not more than 1 to 2 millimeters from the wound edges and about as far apart. Any stay sutures are put in from the inside and are not visible. The vermilion is closed by interdigitating small flaps.

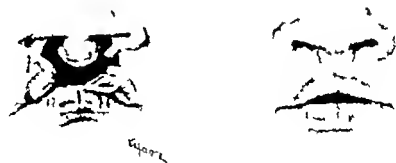


Fig. 12. Design for closure when a tiny prolabium is present. Rectangular flaps are turned down from either side and united beneath the prolabium to increase the length of the lip. In general a full short lip is preferable to a tight long one, so that this design should only be used when the prolabium is quite short from above downward.

closing the double cleft lips. Usually a flap is turned down from the inner surface of the lateral border of the cleft on each side and they are brought together in the midline beneath the prolabium (Fig. 9c). If the cleft is partial on one side and total on the other side a V excision operation may be used on the partial side and a Mirault flap on the total side (Fig. 9b). When the prolabium is unusually large and long so that the Mirault flaps

under it might result in too long a lip, 2 or 3 millimeters of skin can be excised from the bottom of the prolabium to shorten it. If the prolabium is tiny the lateral flaps may be designed in a rectangle (rather than a triangle) to elongate the lip (Fig. 12).

In marking out symmetrical clefts with the columella in the midline, a transverse line is imagined across the prolabium at the level of the base of the columella, and the points A

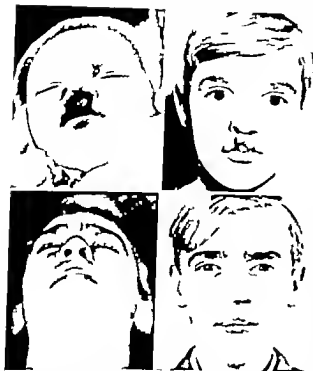


Fig. 3. Initial repair at the age of 1 year. The psychological handicap as very great and all probably never be entirely overcome. As a matter of fact, he called for a mirror as soon as he had awakened from the anesthetic, and kept it constantly under his pillow so that he could reassure himself several times daily that his dream had come true and that he was really going to be like other children.

are marked on either side where this line crosses the mucocutaneous junction. *A* is marked just inside the lower point of the nostril rim on each lateral side of the cleft, being careful to place it in such position that a good nostril will be formed when *1* is approximated to *A* and marking it symmetrically on the two sides (Fig. 9).

The point *C* is at the bottom of the skin of the prolabium in the midline and equidistant from the two *A* points. *B* is $\frac{1}{3}$ of the distance from *C* back to *A* on the curved lower border of the skin of the prolabium on either side.

C' is on the mucocutaneous line of the lateral part of the lip and is opposite the most medial point where there is still full thickness of the vermillion.

To locate *B'* the straight line distance *AB* is measured with small calipers. One point of the calipers is then set on *A* and the calipers rotated until the other point is *BC* distance from *C*.

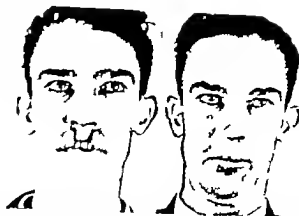


Fig. 4. Initial repair at the age of 3 years. Though the palate was not cleft, patient has so much forward protrusion of the incisor teeth that it was thought best to remove them and substitute a bridge.

The above can be considered as a standard marking and can be altered when necessary. For instance, when the cleft is partial on one side the line *4 B'C'* is sometimes a straight one so that *B'* can be omitted and a straight incision made from *A* to *C'* and a *V* closure done on that side (Fig. 9).

THE CLOSURE

The above points are punctured in and the lines scratched in with 5 per cent alcoholic methylene blue using a fine mechanical drawing pen. The lines are then lightly incised with a knife with care not to cut the points out. An incision is then made in the buccal fornix on each side and carried upward to separate the lip from the upper jaw (Fig. 10). This undermining is carried upward almost to the orbital border until the cheek is separated from the underlying facial bones, and the space between them is packed temporarily with gauze soaked in 1:5,000 adrenalin solution.

The buccal fornix incision is then carried upward inside the lateral wall of the nostril to divide the mucosa between the upper and lower lateral cartilages of the nose until the nostril can be rotated into position and *A* can be brought over to *A'* without tension. A small fine scissors is introduced through the buccal fornix and the lower lateral cartilage of the nostril is separated from the skin covering by alternate spreading and dissecting up to the midline (Fig. 10).

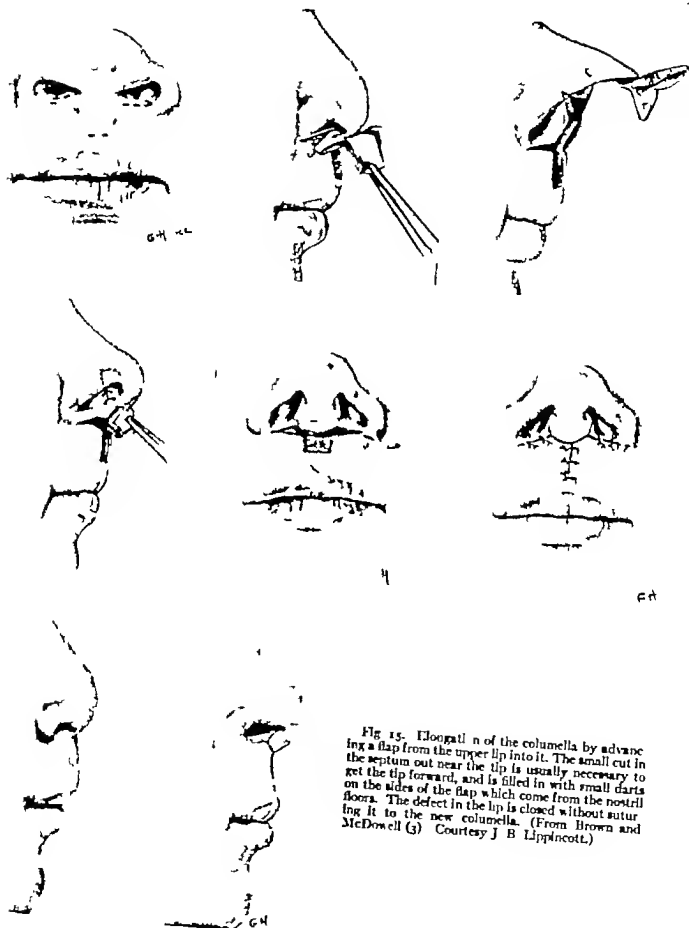


Fig. 15. Elongation of the columella by advancing a flap from the upper lip into it. The small cut in the septum out near the tip is usually necessary to get the tip forward, and is filled in with small darts on the sides of the flap which come from the nostril floor. The defect in the lip is closed without suturing it to the new columella. (From Brown and McDowell (3) Courtesy J. B. Lippincott.)



Fig. 6. Total double cleft similar to that shown in Fig. 6. Closure as done during the first days of life. The columella elongated at about 3½ years of age, and a preserved L-shaped cartilage transplant inserted into the nose at the age of 6½ years. (The improvement shown from left to right. Many of these patients who are born without columella have a deficiency in the septal support of the nose. (Insert shows shape of the transplant.)

The lines ABC are then incised through the full thickness of the lip, a stab blade knife being used with a perpendicular sawing motion (Fig. 11). The small flap $A'B'C'$ is rotated 180 degrees into the nostril floor. The vermillion of the prolabium is turned backward as a flap to use for lining and $A-1$ and $B-B'$ are approximated on both sides. No 000 white silk sutures being used subcutaneously and No 000 black silk sutures in the skin. $C-C'$ are approximated directly under C and fine interrupted black silk skin sutures are placed all along between $A-B-C$. The vermillion closure

is done by interdigitating zigzag flaps from the two sides. The inside mucosa from the two sides is sutured to the prolabium vermillion which was turned back. The nostril floor flaps are trimmed and sutured to the portion of the prolabial skin inside the nostrils and mattress sutures are put through the nostril walls to aid in shaping them. Stay sutures may be put clear across the lip from the inside, encompassing the full thickness of the lip except the skin to avoid any visible suture marks on the outside. (The type described by Lane is a good one.)

A Logan bow is strapped to the cheeks to protect the lip and take tension off of it while crying and the nurses keep the suture lines free of crusts by frequent cleansing. The skin sutures are left in 5 days and the others a few days longer. The baby can usually be fed with a bottle after the first week if the holes in the nipple are enlarged and the child is discharged from the hospital after all sutures are out.

Any surgery on the palate is delayed until about 18 months of age to permit the tooth buds to migrate out of the palate into the alveolus.

The possibility of secondary procedures (3) on the lip is considered from the beginning with the parents, but they will be fewer in number and less in extent if the primary closure is a good one.

Those children who are born with a total double cleft and almost no columella will frequently require a secondary elongation of the latter (Fig. 15) so that this may be considered standard in this type of patient. Further elevation of the nose may be obtained when desirable by an L-shaped cartilage transplant (Fig. 16).

Maintenance of the size and structure of the upper dental arch is important in these patients for lip support as well as for other reasons. The child's dentist is contacted early so that proper dental hygiene may be instituted and he may help later in providing or securing adequate orthodontic care. Limited prosthodontia may eventually be necessary in patients with total clefts.

In addition to dental care, those children who have associated palate clefts may require the assistance of speech therapists and otolar

ingologists. Tonsillectomies and adenoidectomies should not be done routinely but they may be carried out if necessary for reasons of general health or especially if the tonsils and adenoids are contributing to any loss of hearing.

The plastic surgeon can render an additional service if he will examine these patients each year throughout the growing period and advise the parents in regard to these problems as they arise. Though starting with a severe initial

handicap these children often prove to be brighter than average and succeed so well in later life that one feels well repaid for the extra time and effort required in providing the best possible care for them.

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TRANSPLANTATION OF THE URETERS INTO THE RECTOSIGMOID

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CONGENITAL or acquired disease of the urinary bladder may render it incapable of performing its function as a reservoir for collecting the urine and emptying it periodically. The congenital type most frequently seen is extrophy of the bladder (ectopia vesicae). In this anomaly local arrest of growth occurs and the child is born with a defect in the lower anterior abdominal wall. The posterior wall of the bladder is seen as a strawberry like swelling in the suprapubic area. Examination of this strawberry like bulge reveals two small openings on either side through each of which urine is jetted at regular intervals. There is often an associated anomaly of the urethra and other genital organs. Many of the patients die in early childhood from ascending infections to the kidneys or from other congenital defects that are not compatible with life. It occurs according to Spooner 4 times in every 116 000 births according to Neudoerfer once in 50 000 births. Approximately 50 per cent of all persons so afflicted are dead by the tenth year of life.

Injury to the bladder may be the result of difficult and prolonged labor. The bladder and the vesical sphincter as well as the vagina may be lost by pressure necrosis. Such patients are frequently admitted to the hospital with a history of a long and difficult labor terminating in instrumental delivery or spontaneous delivery of a macerated fetus. When the tissue loss is great plastic repair is impossible and ureterosigmoidal transplant is the only operation that will restore continence. In other cases, the damage to the bladder is the result of accidents or bullet wounds, resulting in complete or almost complete destruction of the bladder and sphincter. In most of these cases where tissue loss is great improvement cannot be secured by plastic operations.

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Very early the idea was suggested of establishing continence in these patients by surgically producing a cloacal condition such as exists in birds. According to Mayo the first attempt at such an operation was made by Simon in 1851. In 1896 Maydl transplanted an inverted portion of the bladder wall with the ureters attached into the sigmoid. Moynihan in 1906 performed an extraperitoneal operation in which he inverted the large part of the bladder into the anterior wall of the rectum. To Coffey must go the credit for laying down the principles which have given an anatomico-physiologic clarification of the surgical problems involved. He attracted attention to the fact that when a duct opens into a cavity to discharge its contents, it runs in its terminal part through the wall of the viscera and then opens into its lumen. The terminal part of the duct is intramural in relation to the cavity into which it opens. This is illustrated by the salivary ducts opening into the mouth, the common bile duct opening into the second part of the duodenum, and the ureters opening into the bladder. This anatomical relationship provides a sphincter mechanism and prevents regurgitation of urine into the ureters. Coffey therefore transplanted the ureters into the rectosigmoid by burying the terminal parts into the wall of the sigmoid and the very end of the cut ureter into the lumen of the sigmoid. In 1926 Mayo reported 66 cases of operations carried out by the Coffey technique in which 48 patients were said to have obtained satisfactory results. These operations were done in two stages. In most of his cases a ureteral catheter was used and kept *in situ* for a few days after the operation to prevent obstruction of the ureters. These catheters had one end inside the ureter and the other was brought out of the anal opening. The operation however was improved by Mr Henry Wade of Edinburgh who used a modified Coffey Mayo technique. Mr Wade transplanted both of the



Fig. 1. Incisions are made through the posterior parietal peritoneum exposing the ureters. Ureters divided at the ureterovesical junction and a rubber band tied proximal to the cut end preventing spill. Clamp is passed behind the left mesosigmoid and the left ureter is brought through the mesosigmoid before implantation.



Fig. 2. After the left ureter has been drawn through the mesosigmoid it is now possible to perform the implantation without kinking.

ureters into the rectosigmoid at one operation and he did not make use of the ureteral catheters. Instead he left a wick of catgut inside the ureter to prevent its closure.

At the American University Hospital we have during the last 6 years transplanted the ureters in 19 patients. We have used Mr Wade's technique with changes which are believed to offer certain advantages.

TECHNIQUE OF OPERATION

Thirty-six hours before the operation the patient is given a purge of castor oil. Following this she is put on a fluid diet consisting of water, tea, and lemonade. If her fluid intake is not sufficient she is given fluids in the form of infusions or hypodermoclyses of 5 per cent glucose in saline. The morning of the operation she is given enemas until the return is clear. An injection of morphine and atropine is given 45 minutes before the operation. Ether inhalation anesthesia is used. When fully anesthetized the patient is put in Trendelenburg's position.

A midline infraumbilical incision is used. The right ureter is first identified as near the bladder as possible and the peritoneum over the ureter is incised. The ureter is dissected free for a distance of about 15 centimeters care being taken to leave the periureteral and the ureteral vessels attached to the ureter. A ligature is placed on the ureter as near to the bladder as possible. The ureter is then cut above the ligature with a scalpel (the crushing effect of scissors is avoided) isolated for the

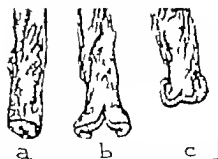


Fig. 3. Longitudinal incision, 1 centimeter long divides the cut end of the ureter and the flaps everted with a suture of No. 0 plain catgut.

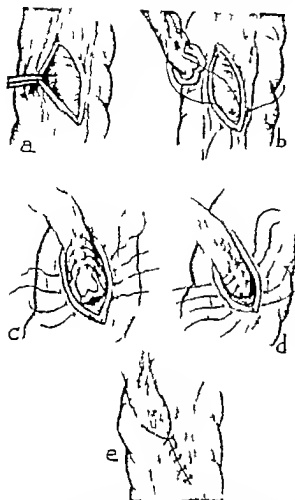


Fig. 4. a, Incision down the muscularis b, broad N suture through peritoneal flap, perireteral tissue and out through the opposite flap c, additional supporting sutures similarly placed d, mucosa of bowel opened with hot cautery and sutures tightened which brings the everted end of the ureter to the bowel lumen, e, sutures tied, anchoring the ureter and approximating the peritoneal covering of the bowel.

appropriate length with the perireteral tissues and lifted into the abdomen. A rubber band is placed around the ureter 2 centimeters proximal to the cut end to prevent spill and to prevent bleeding from the divided ureteral vessels. The divided peritoneum is sutured.

The left ureter is similarly exposed. On the left side however an artery clamp is passed along and parallel to the ureter behind the pelvic colon to the root of the mesentery where the clamp is forced through the mesentery of the sigmoid. The end of the divided ureter is caught by the point of the clamp and pulled



Fig. 5. N chromic sutures are passed through the fascia of the left psoas muscle and the appendices epiploicae and upon being the sigmoid is rotated so that the points of implantation are immobilized in the retroperitoneal space.

up so that it is above the pelvic colon (Fig. 1). The left ureter is now anterior (Fig. 2).

Two longitudinal slits are made in the cut ends of the ureters (Fig. 2) and the flaps turned upward like cuffs and held in place by a stitch of plain catgut (Fig. 3).

The pelvic colon is chosen for the site of the implantation, the left ureter being implanted high and the right lower down. It is best to use the tenia of the colon for the site of implantation. This is incised obliquely for a distance of $\frac{3}{4}$ inch and flaps of serosa muscularis are turned out without opening the bowel mucosa. The distal portion of ureter is laid in this bed, and the peritoneal flaps sutured over the buried portion of the ureter. The terminus of the ureter with the turned up cuffs is left protruding (Fig. 4). After suturing of the flaps, which must be neither too tight nor too loose the mucosa is opened by cautery and the end of the ureter pushed into the lumen of the colon. One additional suture closes the peritoneal flaps over the buried ureter.

The ureter must not be denuded of the perireteral tissue. For fixing the ureters the sutures must pass through the peritoneal flaps and the outer layer of the ureter and periure-

teral tissue, but not through the lumen of the ureter

It is important that the ureters not be pulled upon by the weight of the colon into which they are implanted. Therefore the segment of colon into which the implantation is made is fixed to the posterior abdominal wall at the sites of the exit of the ureters from the posterior parietal peritoneum. This fixing (sigmoidopexy) is best done by making use of the appendices epiploicae. By this same sigmoidopexy the sites of the implantations become extraperitoneal. This is thought to be one of the most important steps in the operation (Fig 5).

The abdominal wall is closed without drainage. Following the operation a rectal tube is introduced into the rectum and kept there. The patient is given about 3 liters of 5 per cent glucose in saline intravenously each day. This increases the urinary output and puts pressure into the renal pelvis and ureters and thus diminishes the risk of obstruction to the urinary outflow.

During the first few days after operation these patients develop an acute irritation of the rectum, but this passes away after 2 weeks. Their fluid intake and urinary output must be measured daily. For the first 3 or 4 weeks the patient passes urine every 3 or 4 hours during the day and once every 5 or 6 hours during the night. It is interesting to note that after several months the feces and the urine do not mix and the patient knows when she is going to pass urine and when she is going to have a bowel movement.

One of the patients with tuberculous cystitis had a double ureter on the left side and a single ureter on the right side. The 3 ureters were transplanted at one operation. The 2 ureters on the left side were transplanted into the same opening, the 2 ureters being approximated by sutures of plain catgut going through the perireteral tissues only.

PROGNOSIS

Sixty-six patients who were subjected to this operation were reported from Mayo Clinic in 1926. Forty-eight of these were living and 18 were dead at time of report. Twenty nine of the living patients reported upon their condi-

tion and of this number 25 were satisfied with the results, 2 had poor control of urine by rectum, 1 was incontinent and 1 complained of chronic irritation of rectum with diarrhea. In the Mayo series the deaths were classified in two groups, those patients dying in the hospital and those dying after leaving the clinic. Of the former, 5 succumbed to peritonitis and 6 to pyelitis, pyelonephritis and pyelonephrosis. Seven patients died after leaving the clinic, all from some disease not related to urinary tract.

Transplantation of ureters into the rectosigmoid has been done 19 times at the American University Hospital since 1937. The technique which has been described was used in all cases. The indications for operation were as follows: (1) exstrophy of the bladder, 7 cases; (2) vesicovaginal fistula, 6 cases; (3) tuberculosis of the bladder, 3 cases; (4) trauma to perineum and bladder, 3 cases.

The surgical mortality in this series was 13 per cent. The 2 deaths are reported in some detail below. The other 15 patients have been discharged from the hospital completely continent. The time elapsing between operation and present report varies from 9 years to 1 year. Only 1 patient in this group has been readmitted to the hospital for a urinary complaint. This was a patient with exstrophy of bladder operated upon in 1942 who was admitted 6 months after operation with acute pyelitis. This responded promptly to sulfathiazole therapy and patient left hospital within a few days. One patient complained of persistent diarrhea for several months after leaving hospital. This has subsequently disappeared. Without exception these patients began to gain weight and their general health improved soon after operation. The average patient must discharge the urine from the rectum about every 5 hours during the night and every 3 or 4 hours during the day.

DEATHS FROM TRANSPLANTATION OF URETERS

CASE 35325. In a male baby 25 days old the diagnosis was exstrophy of the bladder. On April 22, 1942 transplantation of both ureters was done at one operation. The baby died 30 hours after operation the cause anuria.

CASE 38842. In a woman 35 years old the diagnosis was tuberculous cystitis. Patient had 13 preg-

nancies of which 4 were abortions, 9 normal deliveries. Five of the children died in childhood, 4 are living and healthy. She had cystitis of $3\frac{1}{2}$ years' duration, and had been treated conservatively with irrigations and urinary antiseptics. She had never improved and for the last 2 years had had constant dribbling of urine day and night with burning. Her bladder capacity was 5 cubic centimeters. guinea pig inoculation was positive for Koch's bacillus. Transplantation of both ureters was done on May 29, 1944. Ten days later the wound opened completely and the intestines were eviscerated. These were put back and the wound sutured. The patient developed peritonitis and died 18 days after transplantation of ureters, 8 days after evisceration. There was an average of 1,000 cubic centimeters of urine daily from the rectum.

SUMMARY AND CONCLUSIONS

A simplified technique for ureterosigmoidal transplantation has been described. The im-

portant innovations are (1) elimination of ureteral catheters (2) single stage operation (3) transplantation of the left ureter only after bringing it through the mesosigmoid, thus eliminating kinking (4) eversion of the ureteral ends in order to prevent stricture (5) fixation of sigmoid to the posterior parietal peritoneum in such a manner as to extraperitonealize the sites of anastomosis.

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THE OBJECT, THE VALUE, AND THE TECHNIQUE OF PREOPERATIVE AND POSTOPERATIVE X-RAY TREATMENT IN CARCINOMA OF THE BREAST

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IN the United States cancer of the breast caused 16,379 deaths during the year 1944 or a crude death rate from this disease of 12.4 per 100,000. Since the average length of life before death is from $3\frac{1}{2}$ to 4 years, and since about 20 per cent of all cases are cured, we have a right to assume that there are in the United States at present about 60,000 cases of cancer of the breast. In a previous study we have found suggestive evidence that roentgen therapy is of value in the prevention of cancer of the breast, by treating the chronic mastitis which often precedes, and which is commonly associated with, cancer of the breast.

In this paper we shall try to present the value of preoperative and postoperative roentgen therapy. We shall omit discussion of the value of irradiation as a *primary* and single form of treatment of recurrences, the value of which is recognized by nearly everyone. We are further confining this discussion to the stage 2 with axillary metastasis, proved by operation. Harrington Greenough and Taylor, Lund, and Roeden have shown that microscopic examination is essential for accurate diagnosis of cancer in the axilla.

Roeden discusses the prognostic importance of "sinous catarrh" in the axillary glands, and says "If the sinous catarrh is of any significance, it must be conceived as an expression of a preliminary stage to the metastasis resulting from a toxic irritation, or possibly from an irritation caused by solitary tumor cells."

It would seem to us that with this thought there is an indication for preoperative irradiation whenever there are palpable lymph nodes and perhaps when there are no palpable nodes since there is a possible error of about 30 per cent in such cases. Roeden found that 36 per

cent of his 44 patients with sinous catarrh died of cancer, while only 20 per cent of 70 patients who were without sinous catarrh died of cancer.

We believe that patients with operable cancer of the breast should be operated upon and as promptly as possible. On the other hand when a patient absolutely refuses operation and refuses to see a surgeon or for some reason cannot be operated upon we should give the patient with technically operable cancer the second best chance with primary irradiation. Sometimes after this preliminary irradiation, one can still induce the patient to accept operation, otherwise one must administer the radiation to the limit of the normal tissue toleration.

In using the term 'preoperative irradiation' we definitely plan for operation when possible, within 3 or 4 weeks from the beginning of the roentgen therapy, and as soon after the preoperative irradiation as conditions will permit. We do not refer to preoperative roentgen therapy as *just any kind of x ray therapy* that is given before an operation but we refer to the treatment given preparatory to and with operation definitely planned. We advise consultation with the family physician, the surgeon and the radiologist at the beginning whenever cancer of the breast is suspected, so that the plan of management may be outlined and controlled.

The "operability" of cancer of the breast should not depend merely upon the consent of the patient. Portmann as a radiologist and Haagensen as a surgeon have repeatedly demonstrated that many patients with advanced cancer of the breast would be expected to live longer and be more comfortable without operation. Portmann very properly says, "All patients with cancer of the breast may be oper-

ated upon, and therefore would be operable. Therefore these terms operable and inoperable should be discarded and *surgically curable* and *surgically incurable* should be substituted which would define the objective and limitation of surgical procedures.

The conditions of "operability" (surgically curable) and "inoperability" (surgically incurable) as described by Portmann agree practically with those given by Haagensen (surgeon) and Stout (pathologist). After reviewing the results which they have obtained, Haagensen and Stout say

"From these correlations we have drawn up a rule for judgment of operability in breast carcinomas as follows: Women of all age groups, who are in good enough general condition to run the risk of major surgery should be treated by radical mastectomy except as follows:

"1. When the carcinoma is one which developed during pregnancy or lactation.

"2. When extensive edema of the skin over the breast is present.

"3. When satellite nodules are present in the skin over the breast.

"4. When intercostal or perasternal tumor nodules are present.

"5. When there is edema of the arm.

"6. When proved supraclavicular metastases are present.

"7. When the carcinoma is the inflammatory type.

"8. When distant metastases are demonstrated.

"9. When any two or more of the following signs of locally advanced carcinoma are present:

(a) ulceration of the skin (b) edema of the skin of limited extent (less than one-third of the skin over the breast involved) (c) fixation of the tumor to the chest wall (d) axillary lymph nodes measuring 3.5 centimeters, or more in transverse diameter and proved to contain metastases by biopsy (e) fixation of axillary lymph nodes to the skin or the deep structures of the axilla, and proved to contain metastases by biopsy

They say further

"If these criteria had actually been followed in judging operability in the series of 650 radical mastectomies which we have reported a total of 100 of the patients would not have been operated upon. Yet the number of patients permanently cured would not have been decreased by a single one.

Harrington who has reported on 6,558 cases of cancer of the breast from the Mayo Clinic does not exclude the pregnant lactating breast or those with a few skin nodules near the tumor

PREOPERATIVE IRRADIATION

An insufficient number of cases of preoperative irradiation have been recorded to justify any final conclusions from statistics. Many authors have the impression that it is of definite value. Hoffmeyer (Copenhagen) found that after 1000 to 4,800 r were used, histologically a diminution of the cancer cell area corresponds approximately to the macroscopic recession of the tumor but in no case was there complete disappearance of cancer cells. With the technique which we use, it is not our aim or expectation to destroy all cancer cells but only the more malignant cells which are the more sensitive, and which are more likely to give rise to metastases. Peters of the Toronto General Hospital says, "Stage 2 would be markedly improved by the institution of preoperative radiation in preference to and in some instances combined with postoperative treatment.

THEORETICAL AND BIOLOGICAL EVIDENCE FAVORING PREOPERATIVE IRRADIATION

Tendency of preoperative irradiation to demoralize or destroy the more malignant types of cells
It is well known that the microscopic grade of malignancy has much to do with the prognosis of carcinoma of the breast after operation. As indicated in statistics prepared by Harrington in 1935 at the Mayo Clinic, approximately 91 per cent of the group of 1,907 patients having invasion of the lymph nodes had cancer of microscopic grades 3 or 4 and of the 481 patients having these grades 3 and 4 who were traced, only 20.5 per cent who had operation alone lived 5 years. Harrington found in a study of 2,396 operable cases at the Mayo Clinic, 80.6 per cent were in stage 2. It will be further observed from his table that the patients with cancer of microscopic grades 3 and 4 represented 90 per cent of the 1,907 patients with involvement of the lymph nodes and those with grades 1 and 2 approximately 10 per cent. It must be clear therefore that the greatest problem arises when dealing with the microscopically more malignant grades 3 and 4, with axillary involvement or in the clinical stage 2. This type represents approximately 80 per cent of all operable cancer of the breast. These microscopic grades of malignancy can be deter-

mined only after a complete operation and a study of the entire breast (Dawson and Tod). Even grades 1 and 2 (representing 10 per cent of all cases) are liable to contain some of the more malignant cells. Therefore, when axillary involvement or enlarged lymph nodes are present, all patients should have both preoperative and postoperative irradiation. Dawson in a study of 460 mammary cancers of all stages of growth found the axillary tissue involved in 70 per cent. Lynham estimated that 75 to 95 per cent of all mammary cancers show spread beyond the actual breast when first examined.

It happens that, so far as the microscopic classification is concerned grades 3 and 4 are especially radiosensitive while grades 1 and 2 are much less so. This too, is a matter of common knowledge and common agreement. Unfortunately grades 3 and 4 lead to early and extensive metastasis and therefore give most of our failures. This is evident in the table mentioned which shows that in 91 per cent of the total cases of involvement of the lymph nodes the cancer was of grades 3 or 4. It is also self-evident that unless the irradiation is applied to the area in which the malignant cells are located ultimate failure will result. Therefore the earlier the diagnosis is made before distant metastasis occurs and the earlier the patient is treated by irradiation the better will be the end result. Bloodgood recommended immediate irradiation of the axilla and the breast in all cases of doubtful or malignant tumor.

Because the more malignant type of cells (stages 3 and 4) are rendered less malignant by even a moderate amount of irradiation it is fair to assume that such irradiation given to a patient with carcinoma of the breast will partially devitalize the more malignant type of cells which are the cause of extensions and of the surgeon's failures (Halley and Melnick). Because of devitalization of the cancer cells preoperative irradiation should decrease the recurrences which are due to implantation during operation (Brandes 1946) and should also render less liable distant metastases which are caused by emboli that have been carried through either the lymph stream or the blood stream such as may result from the manipula-

tions connected with the operative procedures. Such devitalizing effect of irradiation on the more malignant cancer cells surely occurs immediately, even though it cannot be demonstrated at once microscopically. Therefore there is no advantage from this standpoint in prolonging the interval before operation and the operation can take place as soon as the proper amount of irradiation has been given to the tumor areas which we estimate to be about 1200 roentgens given within a period of 2 weeks.

Normal tissues less receptive to implantation after preoperative irradiation. Biologic experiments (Murphy) and (Russ and Scott) indicate that in addition to the effect of irradiation on the malignant cells there is an effect on normal tissue which is detrimental to implantation of carcinoma. Russ and Scott utilized rats and have exposed to irradiation two of the opposing quadrants of the outer two-thirds of a circle of skin protecting the central area of the circle and the other two quadrants. They then implanted malignant disease in the unexposed center. In all instances the tumor tissue grew by preference into the unirradiated areas. This effect was evident even when as little as 50 or as much as 100 per cent of an erythema dose was used and was also effectual even when the irradiation was given several days before the inoculation.

In view of these facts preoperative irradiation is definitely indicated especially when carcinoma of the breast is in clinical stage 2. The preoperative treatment which we recommend can usually be given in approximately 2 weeks and the patient can be operated on usually during the third week. There is therefore no great delay in the operation and such irradiation will not interfere with the technical procedures of the operation itself. Preoperative treatment has been recommended by one of us (Pfahler) since 1915 but until recent years relatively few patients have been referred for such treatment, and not enough patients have been given the short type of preoperative treatment to make of value any statistical statement regarding them.

In the past, preoperative treatment has been given to three types of patients (1) those with cancer in clinical stage 2 previously described

(2) those with cancer belonging to Steintal group II-C, which is doubtfully operable but which is made more operable by preoperative treatment and (3) those with cancer which is totally inoperable but which by prolonged treatment and an interval of 2 or more months is sometimes made operable. For the sake of brevity we will confine this discussion to cancer which has invaded the axillary nodes but which is still clearly operable, and which we classify as stage 2.

Time for operation after preoperative irradiation As indicated by the investigations of Halley and Melnick one must not wait too long or regrowth of surviving tumor cells will occur within 4 to 6 weeks. We are recommending operation in about 3 weeks after beginning irradiation or a few days to a week after finishing the preoperative irradiation or as soon as circumstances permit.

It has been our experience that usually the more advanced cases are referred for preoperative or postoperative x ray treatment and the more favorable cases in stage 2 are not referred. Adair has studied the results of 7,419 cases of breast cancer of which 47.6 per cent or 3,535 cases were operable. He states, "The 194 cases treated by surgery alone—represents a 'selected group' as evidenced by the high percentage of 5 year salvage, namely 43 per cent, and the older age level. When no axillary nodes were involved 74.2 per cent 5 year salvage was obtained."

Adair did a masterful piece of research on preoperative irradiation and thought he had solved the problem. He concluded that preoperative irradiation gave no advantage, but waited from 6 weeks to 3 months after the irradiation for the operation. In 1936 Adair stated that this interval varied from 12 days to 300 days with an average of 66 days. In 1936 referring to the results of radical operation in the hands of the best surgeons, Adair said "If both the breast and axilla are involved the 5 year cures are approximately 20 per cent. Adair (1943) found Of the 337 patients having axillary involvement operation and preoperative x ray treatment 119 or 35 per cent had a five year survival while the 177 patients having axillary involvement subjected to operation immediately and

followed by postoperative x ray treatment, 74.41.8 per cent—survived 5 years.

In waiting so long after the preoperative x ray treatment Adair was undoubtedly influenced by the opinion of our late great tumor pathologist, Dr James Ewing. Dr Ewing had found that more and more cell degeneration developed as time went on but we think this delay permitted the more resistant types of cancer cell to recover as demonstrated by Halley and Melnick. The delayed operation did permit a better estimate of the value of the primary treatment of cancer of the breast by irradiation. On the other hand it had the disadvantages of delay in operation which permits growth of the radioresistant cells and extension beyond the operative or irradiated field.

Halley and Melnick have made an extensive histological study of the effects of irradiation in 300 transplantable rat tumors and also human breasts, and conclude that irradiation by fractional methods acts directly on human breast tumor cells in a two-fold manner producing early a simple radionecrosis of sensitive cells and later accumulation of mutation like effects through succeeding generation of daughter cells. Regrowth of surviving tumor cells appears 4 to 6 weeks after termination of therapy. They therefore, recommend operation within 2 to 4 weeks after a short period of preoperative irradiation.

Stewart believes that preoperative irradiation is bound to raise the number of cures more than is any other method especially in those cases in which the axillary lymph nodes are involved.

Peterson, Todd, and Russell have reviewed 601 cases treated during 1924 to 1936 some of which received preoperative treatment. They believe from observation in these cases and from results published by others that preoperative is preferable to postoperative roentgen treatment. They state, "It is now fairly generally accepted that a course of postoperative irradiation is a useful prophylactic against local recurrences."

Roeden found that the preoperative treatment yields better results than the postoperative roentgen treatment. He found in stage 1 71 per cent (38 cases) 5 year survival with op-

eration and postoperative roentgen therapy and 90 per cent of 48 patients receiving preoperative irradiation, operation, and postoperative roentgen therapy. In stage 2 operation gave only 25.5 per cent of 51 cases operation plus postoperative roentgen therapy gave 25.5 per cent ("only the more advanced cases received postoperative treatment") and with preoperative roentgen therapy, operation and postoperative roentgen therapy there was 36.5 per cent survival. He says, "Practically all cases have been given preoperative irradiation since 1928."

Time for postoperative irradiation. A review of our own records as well as a study of the literature shows that many patients are sent for "postoperative treatment at a time when they actually have evidence of recurrent disease and should not be class with "postoperative irradiation," but should be grouped with "recurrent carcinoma." It is our opinion that to get the best value from postoperative treatment the patient should be referred as soon after the operation as her general condition and circumstances will permit which is usually within 10 days to 2 weeks, even though the wound is not entirely healed. We have not found that postoperative irradiation interferes with the healing of the wound, nor have we found that the wound breaks down because of postoperative irradiation. If preoperative irradiation has been given one may wait 3 or 4 weeks after the operation before giving the postoperative treatment.

Ovarian sterilization as a preoperative or a postoperative prophylactic measure. It is well known that cancer of the breast is more malignant in young women (Sistrunk and MacCarty). Dresser found that of forty-eight women under 40 treated by radical mastectomy, only 12.5 per cent were free from disease at the end of 3 years. Lee says, Of the patients 40 years or under 27 per cent were alive and well at the end of 5 years, whereas of those over 40 years of age 45 per cent were alive and well at the end of 5 years.

Cancer of the breast also grows more rapidly during pregnancy (Steel). Haagensen gives pregnancy as a contraindication for operation. Therefore, pregnancy should be avoided in a case of cancer of the breast by arresting the

ovarian function. Experimental evidence indicates that the ovarian hormones stimulate the production of cancer of the breast in animals of a cancer strain or which have any susceptibility to the development of cancer (Loeb, Lacassagne). In cases of recurrence of metastasis, oophorectomy (Schinzinger, Beatson, Lett, Boyd, Torek, Thomson, and Fouveau de Courmelles) and also ovarian sterilization by irradiation (Dresser, Hoffman) have been followed in a considerable number of cases by a disappearance of the lesions. A woman who has had carcinoma of the breast is proved to be susceptible to the disease and Harrington's (January 1946) statistics indicate that approximately 70 per cent of 3,511 traced patients with axillary metastases have remnants of the disease in the system after operation or they would not have died of the disease within 5 years. Consequently, any stimulation from the ovaries in such cases is liable to shorten life. Therefore, we recommend ovarian sterilization for all women with cancer of the breast who are still in the menstrual time of life. Reports by Torek and statistics by Ahlborn seem to indicate some value of ovarian treatment even after the menopause. Dresser on the other hand has not been able to recognize any benefit after the menopause.

TECHNIQUE

The technique has varied tremendously not only among different radiologists but even in our own experience. This is natural for radiotherapy has been a rapidly developing procedure. New knowledge has accumulated since the discovery of roentgen rays approximately 50 years ago concerning both the disease and the effects of irradiation. Therapeutic technique with these rays has been developed or undergone evolution particularly during the past 38 years, beginning with a few scattered workers and gradually spreading until now it is not only universally utilized but is being used in all branches of medicine. Our own experience (Pfahler) in treating carcinoma of the breast covers over 44 years and naturally there has been a considerable variation in technique during this evolution. No technique can be standardized even yet. Considering general principles our own technique has in

volved from the beginning to the present time the use of fractional dosage carried over a considerable period. Therefore, instead of reviewing all that has been done and the variations that have taken place, we will be content with a description of our own present technique, which may be modified as newer knowledge is developed.

Technique for short preoperative treatment

Short preoperative treatment is used when the cancer is still clearly in an operable stage but is no longer confined to the breast. The object is to devitalize the more malignant type of cells with moderate dosage without causing undue delay or interference with the operation itself and with no expectation of destroying all cancer cells in the treated area. Of course no effect is produced on the cancer outside of the area treated. Ordinarily we aim to finish this preoperative treatment in approximately 2 weeks and to give approximately 1000 to 1400 roentgens through each side of the breast and through the axillary and supraclavicular region and when there is much fat or advanced axillary glandular enlargement an additional posterior axillary portal is used. This is approximately the same dosage in each portal as is used in the preoperative treatment in Stockholm—Radiumhemmet and Maria Hospital (Berven and Roeden)—Sophiahemmet (Forsell)—Red Cross Hospital (Åkerlund) but we use four or five portals instead of two because we believe that it gives better distribution even though it involves more work. The cross-fire value of this will equal approximately 200 to 350 r units in the diseased area at each treatment or a total of 1000 to 1400 roentgens in the tumor area. For all of this treatment, we utilize 180 or 200 kilovolts, 50 cubic centimeter distance, and 0.5 millimeter of copper filtration. For portals (Fig. 1) we utilize the space from the parasternal line to the nipple line, turning the patient on the side and irradiating tangentially so that the rays will include the chest wall but not penetrate the lungs. A similar tangential dose is given through the mammary area externally extending from the midaxillary line to the nipple line also tangentially avoiding penetration of the lung but including the chest wall. An axillary portal occupies the space between the posterior and

the anterior axillary folds, and the rays are directed upward and inward so as to irradiate the axilla, the coracoid or infraclavicular region and the deeper portion of the supraclavicular area. Tangential rays are again utilized and the chest walls and the upper mediastinum included but not the lung. A portal is then utilized including the supraclavicular region and the coracoid region and the rays carried from the lower border of the anterior axillary fold upward and inward to the lower border of the sternoclavicular junction. In stouter persons, a similar portal is utilized through the posterior axillary field the same general principles being carried out. This should give a rather even distribution of irradiation and should give approximately an erythema dose value into all of these tissues. This amount of irradiation is intended to be supplemented by postoperative irradiation. We are very particular about the exact division of portals, and the exact direction and the distribution of the rays so as to secure a uniform irradiation and to miss none of the corners.

Technique of postoperative irradiation (Fig. 2)

We generally begin postoperative treatment through a portal occupying the supraclavicular and coracoid region outlined approximately similar to the one utilized in the preoperative treatment and for a second portal of entry we usually use the posterior axilla, with the arm thrown over to the opposite shoulder and the rays directed into the axilla, into the deeper part of the supraclavicular region and toward the upper part of the mediastinum. Generally the arm cannot be abducted sufficiently to get a portal of entry into the axilla itself after operation. As a third portal we utilize a large area extending from the lower border of the coracoid and supraclavicular portal to the level of the epigastrium and extending from the right border of the sternum to the left anterior axillary fold. Because of the large area involved, because of the lung and the heart underneath and because irradiation of this area is apt to give rise to radiation sickness, we give relatively smaller doses over this field. We utilize for postoperative treatment over this portal the so called low voltage technique, using 135 kilovolts, 2

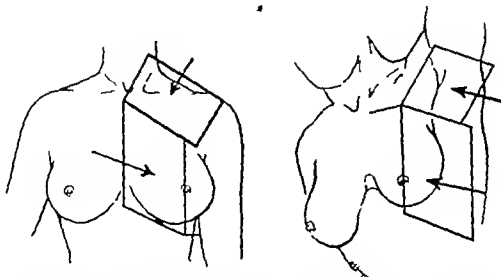


Fig. 1. Shows the areas utilized for preoperative treatment. These areas are carefully marked on the skin so that no part of the skin is doubly treated or is missed. The supraclavicular area is directed to the lymphatic area extending from the axilla to the upper mediastinum. In order to bring the axillary tissue into the field, a small sandbag placed in the posterior axillary depression and with the arm separated from the body will permit more radiation to reach the deeper part of the axilla. For the inner field of the breast, the patient is rotated on the affected side with the sandbag placed under the breast so as to bring the breast almost on a level with the treatment localizer. For the external portal, the patient is rotated to the opposite side. The breast is propped up with a sandbag so as to bring not only the entire breast but part of the tissue outside of the breast into the field for treatment. For the axillary field, the arm is placed above the head and the rays are directed into the axilla and toward the base of the neck and upper mediastinum.

millimeters of aluminum filtration and 50 centimeter distance. Generally we can give only about 200 or 300 roentgens in each application sometimes less but we aim to deliver into this area a total of approximately 1 800 to 2,400 roentgens counting both preopera-

tive and postoperative treatment. The treatment is given according to the saturation technique, and we should not exceed a full erythema dose at any time. We aim to deliver into the axilla coracoid and supraclavicular region approximately 1 800 to 2,400 roentgens

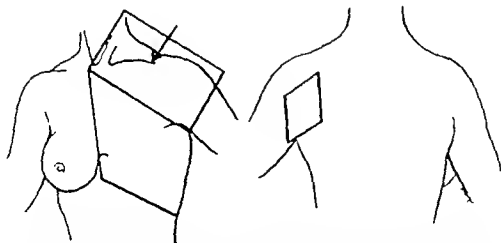


Fig. 2. For postoperative irradiation the supraclavicular area is handled as in Figure 1. The operative field is brought into position by rotating the patient so as to level the area as much as possible. The axillary space is treated postoperatively chiefly through the posterior axilla because one generally cannot raise the arm sufficiently to go directly

This will bring about a definite erythema, but we have not found that it interferes with the healing of the wound or the convalescence of the patient. If there has been no preoperative irradiation we believe that the postoperative treatment should begin about 2 weeks after operation while the congestion is present and while any cells that have been implanted or transferred are not yet completely adapted to the tissues of the host and while the cancer cell is more radiosensitive than it would be later. If preoperative treatment has been given we can wait 3 or 4 weeks to begin postoperative treatment.

To help in the avoidance of radiation sickness we generally give intramuscular injections of 10 milligrams of thiamin chloride or more recently one of two preparations with the following formulae, in each cubic centimeter of solution

	milligrams		milligrams
(a) Thiamin hydrochloride	0	(b) Thiamin chloride	30.0
Riboflavin	1	Riboflavin	3.0
Pyridoxine hydrochloride	1	Nicotinamide	70.0
Calcium pentothamate	50	Calcium pentothamate	5.0
Nicotinamide	50	Pyridoxine	5.0

THEORETICAL AND BIOLOGIC CONSIDERATIONS FOR POSTOPERATIVE IRRADIATION

Local postoperative treatment is intended (1) to destroy any malignant cells that may have been transplanted during operation (2) to destroy any microscopic remnant of cancer tissue which the surgeon may have missed and (3) to render the normal tissue more resistant to cancerous growth. Definite evidence of implantation is furnished by the rare observation of clearly demonstrable stitch hole recurrences. Other more frequent implantations probably occur under the skin flap. It is our impression that remnants of cancerous tissue left behind are rendered more malignant and also more radiosensitive by the congestion following the traumatism of operation unless controlled by postoperative irradiation. It is generally admitted that local and regional recurrence is the result of incomplete operation but since 38 per cent of the patients whose operation is a failure have local recurrences and 15 per cent axillary recurrence

(Creyssel and Morel) it is seen that 53 per cent of the operations which fail are incomplete. All of these recommendations are intended to lessen the number of failures connected with surgical intervention for in the clinics where the basic principles of radiotherapy have been followed most closely and where the radiologists have mastered a good technique, postoperative irradiation has become almost a routine procedure.

Since almost everyone recognizes that roentgen therapy is of value in the treatment of recurrent cancer and since recurrent cancer is proof that cancer cells were left behind at the time of operation it is reasonable to assume that the same irradiation given while the disease is only microscopic and the cancer cells not yet well nourished and adapted to their surroundings, will produce even a better chance of destroying the disease. It is unreasonable to expect cure or prevention of cancer that develops at points distant to the area treated.

Haagensen and Stout in their masterful review of 640 cases in all stages obtained 47 per cent of 5 year survivals after operation but local recurrences occurred in 22.8 per cent. It would seem that thorough postoperative roentgen treatment might prevent many of these since even they favor irradiation for recurrences. Surely recurrences at the beginning are more easily controlled.

Tables I, II, III IV and V represent a fair review of the available records in most of the leading clinics throughout the world so far as they can be recognized as to the stage of the disease.

DISCUSSION

Every physician surgeon or radiologist knows that carcinoma of the breast and its treatment is a very complicated problem. As will be observed in Table I with surgery alone referring to stage 2 cases, the 5 year survival percentage varies from 24.3 to 47.3 per cent, and with surgery and postoperative roentgen treatment, the variation is 25.5 to 41.8 per cent. In general, the results show some improvement as a result of postoperative irradiation.

In Table II there is involved a much larger percentage of cases which were treated by surgery alone in different clinics as compared with

the combination of surgery and postoperative irradiation in another series of clinics. It has not been possible in all instances to separate in the records the cases in stage 2, and because of that fact some excellent records have been omitted. It is self-evident that if the records are made up of stages 1 and 2 or possibly stages 1, 2, and 3, the end results will vary with the number of stage 1 cases that are added. It will be seen however that in spite of these tremendous variations there is a general improvement when postoperative irradiation has been used.

In the group of stage 2 cases in Table III treated with preoperative and postoperative roentgen therapy, the general results are shown to be still better than with postoperative treatment alone.

Table IV and the associated letter and comments refer to the records made by Dr. Gordon Richards which he is preparing for presentation in London in the near future.

Table V refers to the review of our own records of postoperative roentgen treatment during the period 1902 to 1941 or approximately 40 years. These results are influenced by the

TABLE I—RECENT COMPARATIVE 5 YEAR RESULTS IN BREAST CANCER STAGE 2

Author	Surgery alone		Surgery and postoperative irradiation	
	No. cases	Percent living 5 years	No. cases	Per cent living 5 years
Adair	85	47.5	177 ¹	41.8
Graves	46	23.0	35	40
Haagensen & Stout	144	24.7	145 ²	5.5
Harrington (1940)	73	24.5	90 ³	20.4
Rorden	21	14.5	21	5.5

¹Adair says these cases were "selected."

²Harrington (Report 1940). The surgery was done in the 16 or 17 Clinics—one of the greatest clinics in the world, but the postoperative irradiation in most cases was carried out at scattered points throughout the country.

³Only the more advanced cases received postoperative treatment in the early records.

Remarks: It is the general opinion of many leading radiologists that in many clinics only the more advanced or unfavorable cases in "stage 2" are referred for postoperative irradiation. Haagensen and Stout say in evaluating these data we again meet with the fact that postoperative prophylactic radiation is more often administered to advanced cases which produces the results.

operative results from many different surgeons and therefore again can be depended upon only as an impression.

The statistical records show a tremendous variation in the terminal results whether pa-

TABLE II.—RECENT COMPARATIVE 5 YEAR RESULTS IN BREAST CANCER IN STAGE 2—OPERATED UPON IN DIFFERENT CLINICS SHOWING RESULTS WITH SURGERY ALONE AND WITH POSTOPERATIVE IRRADIATION

Surgery alone			Surgery and postoperative irradiation		
Author	Total No. cases all stages	Percentage living 5 years	Author	Total No. cases all stages	Percentage living 5 years
		Per cent Cases			Per cent Cases
Haagensen & Stout	640	27.0 of 185	Evans and Leucette	175	26.6 of 45
Harrington (1941)	1407	30.4 of 2318	Graves	376	24 of 68
Jensen (1936)	15	30.5 of 96	Gylden and Peterson	601	27.0 of 211
Simmons (M.D.H.)	147	30 of 90	Gratack and Stenstrom	54	51.0 of 54
Simmons (Harrington)	116	5 of 74	Pfahler and Kiefer	35	44 of 93
			Poble and Benson	41	28 of 5
			Richards	120	23.3 of 36
			Westermarck	70	37.0 of 55
			Wiersma	36	27.3 of 56
Average		27.4	Average		27.6

Many of the available records do not indicate the exact number of cases in stage 2 but give only the percentage of "survival" cases in stage 2 and are therefore not used here.

Richards has divided his cases with auxiliary involvement into stages which when combined show approximately 25.5 per cent survival.

The averages of the percentages reported by these authors show greater possibility for 5 year survival when surgery is followed by postoperative irradiation, than when surgery is used alone.

TABLE III.—PATIENTS SYMPTOM FREE 5 YEARS AFTER TREATMENT WITH SURGERY AND BOTH PREOPERATIVE AND POSTOPERATIVE ROENTGEN IRRADIATION FOR CANCER OF THE BREAST STAGE 2

Author	No. cases stage	Stage percentage survival
Abelson, Raabenhorn 1904	20	24
Fickler and Karier	63	52.3
Rosen	5	40.0

Remarks: It is very difficult to compare the results from different clinics because of the difference in classification, difference in technique and difference in the objectives. Recently I have had the privilege of seeing Dr. Gordon Richards at the Radiologic Institute of the Toronto General Hospital and have been deeply impressed with his fine results. He is preparing a paper on this subject and at my request has sent the following personal communication:

I am enclosing herewith chart Table IV which shows the position in connection with our preoperative breast cases as completely as I have been able to analyze the results up to the present. This shows the results of treatment of eighty-two preoperative cases up to and including the year 1930. We have compared these results with one comparative group of typical conventional postoperative cases of approximately the same number which actually was the group of cases treated postoperatively during the year 1929. It might be said that this is unfair but that is a typical group and comparable in size to the preoperative group. Most of the preoperative cases were very advanced and in our own work, instead of the usual classification into three groups or stages, we have broken them down into four groups:

Group 1—Representative of the quite early stage.
Group 2—Moderately advanced but still operable according to the usual criteria.

Group 3—More advanced—borderline of inoperability.

Group 4—Far advanced—agreed by all as inoperable.

Group 5—Indeterminate types or carcinomas associated with metastases.

*It is interesting to me to note that there is fairly substantial improvement in all of these groups and that the patients in Group 5 who survived five years were treated radiologically. Some of the preoperative cases came to operation and of those who did so twenty-five per cent were negative for cancer at operation. Since most of these were quite advanced prior to treatment, I think it speaks well for preoperative treatment.

patients are treated by operation alone or treated by a combination of operation and irradiation.

Classification of cases as to clinical stages 1, 2 and 3 is extremely difficult. It depends

TABLE IV.—PREOPERATIVE COMPARED WITH POSTOPERATIVE ROENTGEN TREATMENT GORDON RICHARDS

Group	Total No. cases C. I. M. Group		Alive or controlled				Odds due to pre- operative therapy Per cent
	Preop- erative	Postop- erative	Preoperative		Postoperative		
			No. of cases	Per cent of total of group	No. of cases	Per cent of total of group	
I		22			20	90	
II	6	20	5	83.3	3	75	8
III		20	7	48.6	13	65	16.5
IV	23	6		27		3	8.6
V	2						12.5
Total	31	48	22		39		

Remarks: It will be observed that Richards has deliberately compared the value of "preoperative" with "postoperative" irradiation, and finds the preoperative superior. In comparing this to our technique, he gives the limit of irradiation preoperatively and is followed after a longer time by operation, superficial like the work reported by Adair, but it will be seen that Richards has produced very serious and convincing results. The results in the indeterminate types of carcinoma associated with metastases are truly remarkable.

upon the experience and clinical judgment of the individual physician or the associated group. We all know that even though we classify those patients having metastases in the axilla as proved by surgery as belonging to stage 2, there is still in this group a considerable variation. The early recognition will depend in part upon the early consultation by the patient and also upon the skill with which lymph nodes are recognized by the physician and the results will depend upon the promptness with which the operation is performed on the one hand and on the other hand the de-

TABLE V.—SUMMARY OF RESULTS IN BREAST CANCER ALL STAGES 1902-1941 SURGERY PLUS POSTOPERATIVE ROENTGEN THERAPY SYMPTOM FREE 5 OR MORE YEARS (PFAHLER) (REVIEW OF THE RECORDS AND TABLE PREPARED BY DR. GEORGE P. KEEFER).

	Total	1902-1911		Total	1912-1921			Total	1922-1931			1932-1941
		Stage	Stage		Stage	Stage	Stage		Stage			
Well 5 years	8	23-66%	19-45%	63	23-71%	18-57%	2-4%	30	8-20%	7-4%	103-57%	
Died carcinoma	63	18	67	35	27			17		14	133	
Died of intercurrent disease	5			9								
Not traced	30			3								
Total all cases	93			26				20			116	

44 per cent of 123 cases in stage 1 treated during 30 years were well 5 years.

51.5 per cent of 18 cases in all stages well 5 years or more.

60 cases of primary carcinoma of the breast treated only by irradiation are not included in above series.

521 cases of recurrent carcinoma of the breast following operation and treatment began more than 6 months after operation and in which there was definite recurrence when first seen by us, are not included in the above analysis.

lay and the more advanced stage in the later cases. Therefore one surgeon may have a more advanced group than another. This will, of course affect the final results both when treated by operation alone and also when treated with operation and irradiation.

In like manner there is a variation to the thoroughness with which various surgeons do the radical or Halsted' operation. One competent surgeon may do his operation in 1 hour and another competent surgeon may take 4 hours. Haagensen and Stout's records show that following operations taking 1 hour or less 28.6 per cent of 56 cases survived 5 years and developed 23.2 per cent local recurrences while of 16 cases taking 4 hours or more gave 56.3 per cent 5 year survivals, and only 12.5 per cent local recurrences. Presumably therefore the long operations are more thorough.

The effects of the preoperative irradiation will depend in part upon the thoroughness and the skill with which each dose is applied and will also be influenced by the relative time of the operation in relation to this preliminary treatment and will be affected in like manner by the skill, amount of irradiation, and time of its application for postoperative roentgen treatment.

The results in the treatment of carcinoma of the breast cannot at present be reduced to mathematical accuracy. Therefore, we are still dependent upon the general impression which in our opinion is favorable to both preoperative and postoperative irradiation but it should be applicable particularly to those cases of carcinoma of the breast associated with palpable lymph nodes, in this group it has been proven that there is a possible error of nearly 30 per cent.

CONCLUSIONS

1. Good results in the treatment of carcinoma of the breast depend primarily upon early recognition, accurate diagnosis and thorough operation.
2. The operative results can be improved by preoperative and postoperative roentgen therapy or by a combination of all three.
3. The good results will depend upon the knowledge, the skill, and the thoroughness with

which each of these therapeutic measures is applied.

4. A review of the results obtained in leading clinics throughout the world confirms the above conclusions.

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THE CYSTIC ARTERY AND CONSTITUENTS OF THE
HEPATIC PEDICLE
A Study of

A Study of 500 Specimens

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IN the colic and jejunoileal portions of the digestive tube arterial variation is of a relatively simple order being of the sort encountered in the origin of branches from the trunk of a tree and of twigs from the branches. Simplicity is an adult characteristic of the pattern because developmental change in the small intestine is chiefly one of elongation.

In the arterial supply of the adult liver and the gall bladder certain patterns are preponderant others infrequent. A presentation of the types with record of their frequency should be of interest to the surgeon and to the anatomist.

MATERIALS AND METHODS
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MATERIALS AND METHODS

In the course of the present investigations 500 laboratory specimens were studied consecutively. A sketch was made of each set of vessels. On the basis of these permanent records, types of vascular arrangement were selected. Then for each major type a specimen was selected for illustration. In addition to the types actually encountered several described by other investigators (but not found in the current series) have been figured. These are shown in diagrammatic form (Figs 1 to 79). In order to record relationships of course and caliber of the arteries in this area, 14 specimens were employed for more accurate portrayal of anatomic features.¹

For the convenience of the reader the statistical results of the study have been tabulated (Table I).

OBSERVATIONS AND DISCUSSION

Common hepatic artery The common hepatic artery arose as a branch of the celiac axis (Fig 1) in 83.20 per cent of cases (416 of 500). It was absent (Fig 84) in 12.20 per cent (61 cases). In cases of absence of the common hepatic, the right and left hepatic lobes were supplied by separate arterial branches.

In Figures 80 through 93 the liver has been elevated to expose the inferior surface. peritoneal structures have been removed, but the coexistentness of the biliary pedicle raised to approximating normal interrelationships. In Figure 86 the stomach has been lifted out of the loops to the left. In Figures 87 and 88 the bladder has been lifted out of the loops to the right. In Figure 89 a portion of the jejunum has been cut away and the transected superior mesenteric artery has been similarly retracted.

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[illegible]

TABLE I.—OBSERVATIONS ON ORIGIN AND POSITION OF ARTERIES IN OR NEAR HEPATIC PEDICLE

1. Origin, etc., of common hepatic (or hepatic) artery: 500 cases
 - celiac, 4
 - superior mesenteric, 23
 - aorta, 1
 - absent, 6
2. Origin of right hepatic artery (right ramus of hepatic proper): 500 cases.
 - common hepatic, 416
 - superior mesenteric, 56
 - replacing common hepatic, 23
 - celiac, 4
 - aorta, 1
3. Origin of accessory right hepatic artery: 36 cases.
 - superior mesenteric, 5
 - left hepatic, 3
 - gastroduodenal, 5
 - celiac, 2
 - aorta, 1
4. Origin of left hepatic artery: 500 cases
 - common hepatic, 4
 - celiac, 57
 - replacing common hepatic, 23
 - left gastric, 9
 - gastroduodenal, 1
5. Origin of accessory left hepatic artery: 75 cases
 - right hepatic, 99
 - left gastric, 54
 - common hepatic, 12
 - gastroduodenal, 6
 - celiac, 5
6. Origin of gastroduodenal artery: 500 cases.
 - common hepatic, 377
 - replacing left hepatic, 52
 - right hepatic, 35
 - replacing common hepatic, 9
 - accessory left hepatic, 1
 - celiac, 1
 - absent, 14
7. Origin of right gastric artery: 250 cases.
 - common hepatic, 125
 - left hepatic, 8
 - gastroduodenal, 33
 - right hepatic, 1
 - celiac, 1
8. Origin of cystic artery: 580 cases
 - right division of regular hepatic, 416
 - right hepatic from superior mesenteric, 90
 - left hepatic, 36
 - common hepatic, 6
 - gastroduodenal, 5
 - replacing or accessory right hepatic, 3
 - celiac, 2
 - superior mesenteric, 1
 - superior pancreaticoduodenal, 1
9. Origin of accessory cystic artery: 65 cases
 - right hepatic, 30
 - gastroduodenal, 6
 - common hepatic, 4
 - left hepatic, 3
 - accessory right hepatic from superior mesenteric, 2
10. Origin of single replacing cystic artery: 20 cases
 - replacing right hepatic from superior mesenteric, 36
 - left hepatic, 27
 - right hepatic from replacing common hepatic, 21
 - accessory right hepatic from superior mesenteric, 2
 - common hepatic, 6
 - gastroduodenal, 6
 - accessory right hepatic from celiac, 3
 - celiac, 1
 - superior mesenteric, 1
 - superior pancreaticoduodenal, 1
11. Origin of dual replacing cystic arteries, 15 cases:
 - both from right hepatic branch of superior mesenteric, 7
 - replacing right hepatic and left hepatic, 3
 - both from left hepatic, 1
 - gastroduodenal and accessory right hepatic, 1
 - gastroduodenal and right hepatic branch from celiac, 1
 - gastroduodenal and left hepatic, 1
 - gastroduodenal and right hepatic branch of superior mesenteric, 1
12. Location of hepatic (common hepatic) artery: 419 cases
 - left of common bile duct, 431
 - posterior to same, 7
 - anterior to same, 1
13. Location of right hepatic artery: 500 cases
 - posterior to common hepatic duct, 325
 - anterior to common hepatic duct, 38
 - posterior to common bile duct, 58
 - right of duct system, 1
 - posterior to right and left hepatic ducts, 8
 - left of duct system, 8
 - anterior to common bile duct, 7
 - anterior to right and left hepatic ducts, 4
14. Location of cystic artery: 580 vessels
 - Chalot's triangle, 405
 - anterior to common hepatic duct, 1
 - anterior to common bile duct, 17
 - posterior to common hepatic duct, 2
 - between hepatic ducts, 6
 - anterior to cystic duct and right hepatic duct, 6
 - right of duct system, 5
 - posterior to common bile duct, 3
 - left of duct system, 1
 - posterior to cystic duct and right hepatic duct, 1

A replacing type of common hepatic artery was present (Fig 93) in 4.6 per cent of specimens (23 cases). In almost all instances (22 of 23) the replacing vessel was derived from the superior mesenteric artery (1 from aorta).

In 81.54 per cent of the cases (358 of 439 studied) the common hepatic artery was a long trunk which did not break up into its hepatic

branches until it had come within 4 centimeters of reaching the liver surface (Fig 88). In 18.46 per cent (81 cases) the artery was short and divided into hepatic branches that ascended as separate trunks for a distance of more than 4 centimeters (Fig 87).

Regarding relation to the biliary duct system it may be said that in 98.1 per cent of the

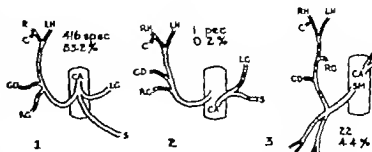
specimens (431 of the 439) the common hepatic artery coursed entirely to the left of the common bile duct (Fig 88). In only 1.6 per cent (7 cases) the artery crossed posterior to the common bile duct, in 0.2 per cent (1 case) it crossed the common duct anteriorly in 0.4 per cent (2 cases) it crossed posterior to the cystic duct before dividing into its terminal right and left hepatic branches.

Right hepatic artery. A normal right hepatic artery (i.e., one which supplies the right lobe of the liver after origin from a normal common hepatic artery as in Fig 80) was present in 83.2 per cent of the cases (416 of 500).

A replacing type of right hepatic artery (i.e., one by which the right lobe is supplied from other than the above-mentioned source) was present in 16.8 per cent (84 cases). In 11.2 per cent (56 cases) the vessel supplying the right hepatic lobe originated from the superior mesenteric artery (Fig 5) while in 1 case (Fig 9) it arose from the aorta. In 4.4 per cent (22 cases) the right hepatic lobe was supplied by the right hepatic branch of a common hepatic artery derived from the superior mesenteric artery (Fig 12), while in 0.2 per cent (1 case) the common hepatic artery arose directly from the aorta (Fig 8). In 0.8 per cent (4 cases) the right hepatic artery arose as a direct branch of the celiac axis (Fig 13), independent of the left hepatic branch.

Accessory right hepatic arteries supplying the right hepatic lobe additive to a normal or replacing artery, occurred with an incidence of 7.2 per cent (36 cases). In 3 per cent (15 cases) the accessory right hepatic artery arose as a branch of the superior mesenteric artery (Fig 6) in 2.6 per cent (13 cases) as a branch of the left hepatic artery (Fig 15) in 1 per cent (5 cases) from the gastroduodenal artery (Fig 11) in 0.4 per cent (2 cases) from the celiac axis (Fig 14) and in only 0.2 per cent (1 case) directly from the aorta (Fig 10).

The location and course of the right hepatic artery are subject to considerable variation. In 65 per cent (325 cases) the artery crossed from left to right posterior to the common hepatic duct (Fig 80) in 3.6 per cent (18 cases) it crossed posterior to the right and left hepatic ducts at a level higher than their juncture. In 11.6 per cent (58 cases) the right hepatic



Figs. 1 to 3. Common hepatic artery (*arteria hepatica*, BNA) variations in origin shown diagrammatically. Abbreviations (Figs. 1 to 79): ALH accessory left hepatic artery; ARH accessory right hepatic; C cystic; CA, celiac axis; GD gastroduodenal; LG left gastric; LH, left hepatic; RG, right gastric; RH right hepatic; RRU replacing right hepatic; S splenic; SM superior mesenteric.

artery crossed anterior to the common hepatic duct (Fig 83) while in only 0.8 per cent (4 cases) it crossed anterior to the right and left hepatic ducts above their point of union. In 11.6 per cent of the specimens (58 cases) the right hepatic artery crossed posterior to the common bile duct (Fig 84) in 1.4 per cent (7 cases) it crossed the common duct anteriorly (Fig 87). In 4.4 per cent (22 specimens) the same artery coursed entirely to the right of the common bile duct and hepatic ducts in 1.6 per cent (8 cases) entirely to the left thereof. In 11.4 per cent (57 cases) the artery crossed posterior to the cystic duct (Fig 87) while in 0.8 per cent (4 cases) it crossed the cystic duct anteriorly.

Left hepatic artery. A normal left hepatic artery (i.e., one which originates from a normal common hepatic artery and supplies the left lobe of the liver, as in Fig 89) occurred in 82 per cent of the specimens (410 of 500). In 1.4 per cent (7 cases) the artery crossed anterior to the right hepatic artery in 0.4 per cent (2 cases) posterior to it.

A replacing type of left hepatic artery occurred in 18 per cent of the specimens (90 of the 500 cases). In 11.4 per cent (57 cases) this artery arose directly from the celiac axis (Figs. 20 and 25) in 1.8 per cent (9 cases) from the left gastric artery (Fig 23), in 4.4 per cent (22 cases) from a replacing type of common hepatic artery which in turn arose from the superior mesenteric artery (Fig 22) in 0.2 per cent (1 case) it was a branch of a replacing type of common hepatic artery which in turn arose as a direct branch of the aorta (Fig 19) and in

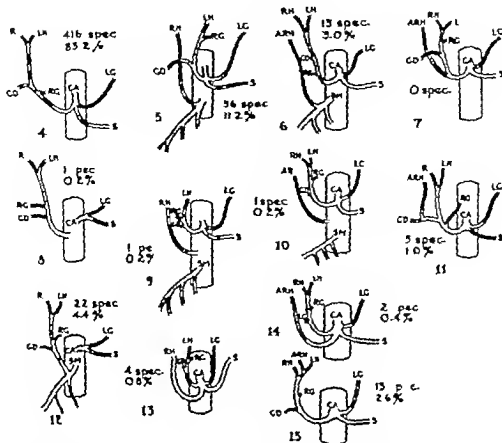
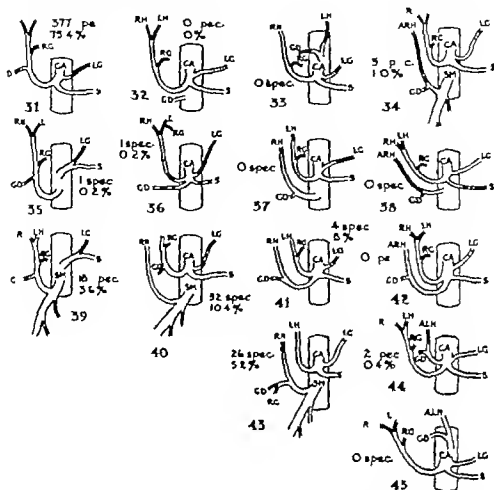


Fig. 4 to 15. Right hepatic artery (*ramus dexter of a. hepatica propria*) variations in origin, diagrammatic.

patric artery arising in the angle termed Chalat's triangle, formed by the common hepatic and cystic ducts (Fig 83). This arrangement obtained in 69.8 per cent of the cases (405 of 580 cystic arteries). The cystic artery crossed ventral to the common hepatic duct (Fig 81) in 21.2 per cent of the cases (123 of 580) dorsal thereto in 2 per cent (12 specimens). The artery crossed ventral to the common bile duct (Fig 88) in 3 per cent (17 cases), dorsal to the duct (Fig 90) in 0.52 per cent (3 cases). In 1.05 per cent (6 specimens) the cystic artery arose from the right hepatic artery in the interval between the right and left hepatic ducts then coursed from left to right crossing the right hepatic duct anteriorly to reach the gall bladder. In 1.05 per cent (6 cases) the artery arose entirely to the right of the duct system and coursed superiorly to cross the cystic duct anteriorly before reaching the gall bladder. In 0.17 per cent (1 case) encountered the artery crossed posterior to the cystic duct (Fig 90). In 1 per cent (5 cases) it arose and coursed entirely to the right of the duct

system, crossing neither the common hepatic, cystic, or common bile ducts (Fig 86). In 0.34 per cent (2 cases) the cystic artery arose as a branch of the right hepatic artery within the portal fissure, from which high point it crossed ventral to the right and left hepatic ducts enroute to the gall bladder.

A single replacing type of cystic artery occurred in 20.8 per cent (120 cases) of the total number of arteries (580). The origin of this vessel was extremely variable. In 30 per cent of these cases (36 specimens) it arose from a replacing type of right hepatic artery derived from the superior mesenteric artery (Fig 84) in 22.5 per cent (27 cases) from the left hepatic artery (Fig 85) in 17.5 per cent (20 specimens) from the right hepatic branch of a replacing type of common hepatic artery derived from the superior mesenteric artery (Fig 93) in 9.10 per cent (11 specimens) from the common hepatic artery (Figs. 69 and 72) in 10 per cent (12 cases) from an accessory right hepatic branch of the superior mesenteric artery (Fig 74) in 5 per cent (6 cases) from the gas



Figs. 31 to 45. Gastroduodenal artery (*gastroduodenalis*) variations in origin, diagrammatic.

proximal portion of that vessel. Then an origin from the distal portion of the hepatic artery proper before division into right and left hepatic arteries would be expected to follow in frequency after that an origin from the left hepatic artery. Further migration down the arterial tree would bring the cystic to arise as a branch of the gastroduodenal artery. Next would be origin as a branch of the common hepatic artery near the latter's source from the celiac axis then derivation from the celiac itself with a long devious course to the gall bladder. Spatially more remote would be a right or accessory right hepatic artery arising not from the celiac axis or common hepatic arteries but from the superior mesenteric; the cystic branch then being derived from the terminal portion of such an anomalous right hepatic artery. When the common hepatic artery and its branches arise from the proximal portion of the superior mesenteric artery or from the aorta itself the cystic artery could be

derived from any portion or branch of this common hepatic trunk but the most common source would be expected to be the terminal portion of the right hepatic artery. A right hepatic artery derived as a separate and distinct branch from the celiac axis would be regarded as rare. A cystic branch of this anomalous vessel is to be expected in the majority of such cases. Migration downward toward the source branch derived of the aorta or even from the axial vessel itself could be expected as less frequent patterns; the cystic thus arising from the celiac superior mesenteric or aorta itself. In rare instances origin could conceivably take place from the terminal gastroduodenal branches; the right gastroepiploic and superior pancreaticoduodenal arteries or even from a supraduodenal branch of hepatic or gastroduodenal origin.

Actually in the 500 specimens examined examples of all but three of the predictable variations of the cystic artery were seen.

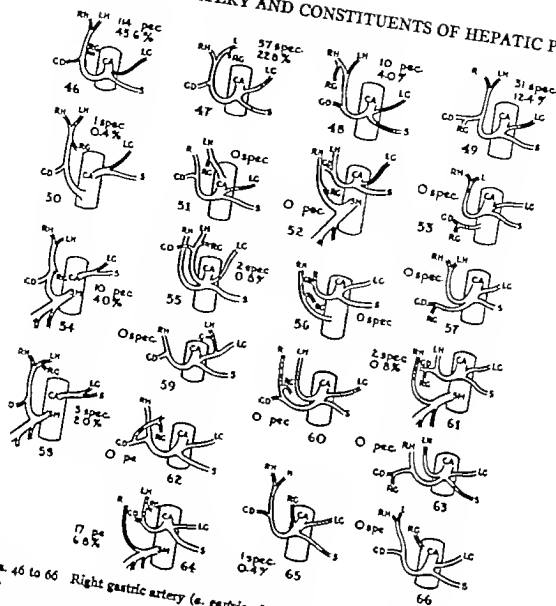


Fig. 46 to 66 Right gastric artery (a. gastrica dextra) variations in origin, diagrammatic.

portal vein before ascending to the right of these structures to reach the gall bladder and its fossa. In 81 per cent (13 of the 16) the cystic artery arose from the common hepatic artery near its bifurcation into right and left hepatic arteries (Fig 60) while in 19 per cent (the remaining 3 cases) it formed a long slender branch arising from the proximal portion of the common hepatic artery (Fig 72).

Type VI The cystic artery took origin from the gastroduodenal artery (Figs. 71 and 88) in 2.6 per cent of the cases (15 of 580). In 73.3 per cent of these (11 of the 15) the cystic artery arose from the proximal portion of the gastroduodenal artery lying to the left of the common bile duct. In all of these instances the cystic artery was long and slender. In only 1 case did the artery ascend to the left

of the common bile duct in the others it crossed the duct anteriorly attaining its right side before ascending to the gall bladder. In 53.3 per cent (8 of the 15 cases) there was an additional cystic artery present derived from a source other than the gastroduodenal artery.

Type VII In only 0.4 per cent (2 cases) in the present series the cystic artery arose as a branch of the celiac axis (Fig 73). In both specimens it was a long slender twing which crossed to the right, posterior to the common bile duct and portal vein then ascending on their right to reach the gall bladder. In both cases the artery formed the sole source of supply to the gall bladder.

Type VIII In 3 cases in the present series (0.6 per cent) the cystic artery was derived from a replacing or from an accessory type of

right hepatic artery the latter derived in turn from a source other than the superior mesenteric artery. In several specimens the right hepatic artery arose as a branch of the celiac axis.

Type IV. In but 0.2 per cent of the specimens (1 case) the sole source of arterial supply to the gall bladder was a long slender cystic artery derived from the first portion of the superior mesenteric artery (Figs 76 and 90). In ascending it crossed posterior to the duodenum, pancreas, portal vein and common bile duct, to attain the right side of the hepatic pedicle, and then to pass upward beneath the cystic duct to the gall bladder.

Type V. In 0.2 per cent (1 case) the cystic artery took origin from the superior pancreaticoduodenal (Fig. 19). The artery was long and slender arising to the right of the common bile duct, it passed almost vertically upward to the gall bladder.

Type VI. Lipschutz has reported 2 cases in which the cystic artery originated as a direct branch from the aorta (Fig. 11). Examples of such an unusual origin were not encountered in the present series.

Type VII. A single case has been reported by Kosinski in which the cystic artery arose as a branch of the right gastroepiploic artery (Fig. 78). No such specimens were encountered in the present series.

Origin of the cystic artery from any arterial branch arising to the left of the abdominal aorta has not been reported by others or seen by the present authors.

Double and triple cystic arteries. Doubling of the cystic artery is relatively common, occurring in 15.6 per cent of the cases (78 of 500). The source of these dual cystic arterial branches is quite variable. Both branches (Fig. 82) are most commonly derived from the right hepatic artery (57 cases). However branches from the left hepatic (Fig. 88) from the common hepatic and from the gastroduodenal arteries (Figs. 86 and 88) also occur in a decreasing order of frequency.

In a single specimen of the current series, three cystic arteries were present, all branching from the right hepatic artery: two arose to the right of the common hepatic duct after the source vessel had crossed beneath the duct.

the third, coming from the right hepatic artery to the left of the common hepatic duct, crossed anterior to the duct to supply the anterior surface of the gall bladder. Two such cases have been reported previously one by Brewer and one by Browne, making a total of only 3 cases in almost 2000 specimens examined.

In one specimen, representing a type not previously described, two cystic arteries were present, the first derived from the left hepatic artery near the bifurcation of the common hepatic artery the second from the right hepatic artery just beyond the point of crossing behind the common hepatic duct (Fig. 89). The two cystic arteries then fused to form a common trunk which coursed along the upper and posterior border of the cystic duct to the neck of the gall bladder where the conjoined channel again divided into branches supplying both surfaces of the gall bladder and its fossa.

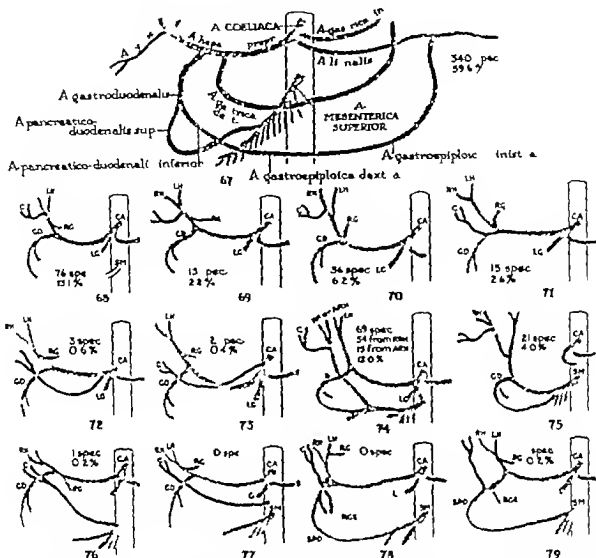
To facilitate our study of the hepatic pedicle the authors have endeavored to depict the sources from which the common right and left hepatic, gastroduodenal and right gastric arteries might theoretically arise. Diagrammatic Figures 1 through 66 serve this purpose.

The common hepatic artery may be derived from the celiac axis (Fig. 1) the aorta (Fig. 2) or the superior mesenteric artery (Fig. 3). When the common hepatic artery is absent, the right and left hepatic arteries may arise from other sources (Figs. 5, 9 and 13).

The right hepatic artery may arise as a branch of a normal or replacing type of common hepatic artery from the superior mesenteric artery, aorta, celiac axis, left hepatic, or gastroduodenal arteries (Figs. 4 through 15).

The left hepatic artery may arise as a branch of a normal or of a replacing common hepatic artery, a replacing type of left hepatic artery may arise as a branch of the aorta, celiac axis, left gastric, splenic, or gastroduodenal arteries. Accessory left hepatic arteries may arise as branches of the common hepatic, right hepatic, left gastric, aorta, celiac axis, splenic or gastroduodenal arteries (Figs. 16 through 30).

The gastroduodenal artery may arise as a branch of a normal or replacing common hepatic artery or it may also arise from any of the following arteries: the celiac axis replacing



Figs. 67 to 79. Cystic artery (*a. cystica*) variations in origin, diagrammatic. In addition to the origins here depicted, the cystic also arose in 3 instances from an accessory or a replacing type of right hepatic artery the latter derived in turn, from the celiac (bringing the total number of cystic arteries studied to 580)

or accessory left hepatic, replacing or accessory right hepatic or the aorta (Figs. 31 through 45).

The right gastric artery may be derived as a branch from a normal or replacing common hepatic artery as a branch of a normal replacing or accessory right or left hepatic artery as a branch of a normal replacing or accessory gastroduodenal artery or as a direct branch of the celiac axis or abdominal aorta (Figs. 46 through 66).

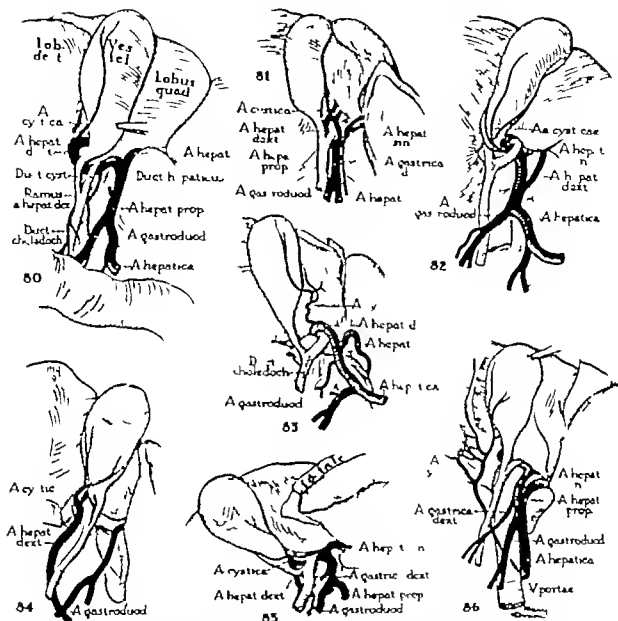
Selected cases While types of arterial source and branching may be conveniently shown by simplified diagrams (Figs. 1 through 79) pictorial records of actual specimens are required for full appreciation of the precise form course and relations of surgically important structures.

Some selected and to a degree typical cases will be discussed in association with drawings prepared in the dissection room.

Figure 80. The cystic artery arose from the right hepatic artery in the angle bounded by the cystic and common hepatic ducts. gall bladder retracted to the left. The right hepatic artery crossed posterior to the common hepatic duct, where it gave rise to a small branch which entwined the common bile duct.

Figure 81. The cystic artery arose from the proximal portion of the right hepatic artery to the left of the common hepatic duct. It crossed the hepatic duct anteriorly after giving off a small branch to the quadrate lobe of the liver. It coursed along the anterosuperior border of the cystic duct to the gall bladder.

Figure 82. The larger of two cystic arteries arose from the right hepatic artery after the latter had crossed posterior to the common hepatic duct dividing immediately upon reaching the gall bladder its



Figs. 80 to 86. Constituents of the hepatic pedicle; prepared from individual dissections.

branches supplied the anterior surfaces of the gall bladder and right half of its fossa. The other cystic artery arose from the right hepatic artery to the left of the common hepatic duct; supplying two small twigs to the quadrate lobe. It then coursed to the right crossing posterior to the hepatic duct to supply the hepatic surface of the gall bladder and the left half of its fossa.

Figure 83: The cystic artery arose to the right of the common hepatic duct from a right hepatic artery which crossed anterior to the common hepatic duct.

Figure 84: A common hepatic artery is wanting. The left hepatic artery arose as a branch of the

celiac axis, coursing upward to the left of the common bile and hepatic ducts. It lay on the anterior surface of the portal vein. The right hepatic artery derived from the first portion of the superior mesenteric artery passed obliquely upward and to the right, first posterior to the portal vein and common bile duct, and then to the right of the common bile duct. Just before entering the right hepatic lobe it gave rise to a large cystic branch to the hepatic surface of the gall bladder.

Figure 85: The cystic artery originated from the proximal portion of the left hepatic. It then coursed transversely from left to right, lying in close associa-

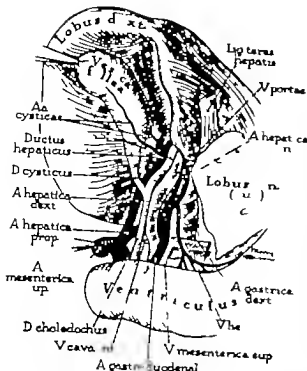


Fig. 95. Constituents of the hepatic pedicle, cooccluded.

to the gastroduodenal artery before ascending to the right of the common bile and hepatic ducts. It gave rise to the cystic artery and then passed posterior to the cystic duct to enter the right hepatic lobe.

Figure 88 The cystic artery arose as a branch of the gastroduodenal. Coursing vertically upward, it crossed anterior to the common bile duct to reach the right half of the gall bladder and adjacent portion of the fovea. A second cystic branch of the left hepatic artery was also present. It coursed transversely from left to right crossing anterior to the common hepatic duct to supply the left half of the gall bladder and fovea. This vessel closely matched the cystic duct in its course while the gastroduodenal branch similarly accompanied the common bile duct.

Figure 89 A rare example of dual cystic arteries, fused distally to form a single terminal trunk. The larger and longer branch was derived from the left hepatic artery near its origin. Crossing anterior to the common hepatic duct, it fused with the second cystic branch derived from the right hepatic artery in the triangle of Calot. The common trunk then coursed along the posterolateral border of the cystic duct to the neck of the gall bladder and there divided into its terminal branches.

Figure 90 The cystic artery derived from the proximal part of the superior mesenteric, crossed posterior to the portal vein and common bile duct to ascend to the right of the latter structure. Near its termination the artery passed in an upward direction beneath the cystic duct to reach the neck of the gall bladder.

Figure 91 A large accessory right hepatic duct entered the common bile duct just distal to that of fusion of the cystic and common hepatic ducts. The cystic artery was derived from the right hepatic artery after the latter had crossed posterior to the common hepatic duct.

Figure 92 The cystic duct drained directly into the right hepatic duct (the common hepatic duct being absent). The cystic artery arose as a branch of the most proximal portion of the right hepatic artery. It crossed in front of the right and left hepatic ducts to reach the gall bladder.

Figure 93 A short common hepatic artery from the superior mesenteric divided into right and left hepatic branches. The right branch crossed posterior to the common bile duct and portal vein, and then ascended to the right of these structures crossing posterior to the cystic duct before giving off a short cystic branch and dividing into its two terminal branches. The left branch ascended to the left of the common bile duct and portal vein passing posterior to the splenic vein before giving rise to a large gastroduodenal and small right gastric artery. Terminally it divided into two terminal branches to the liver hilum.

B. BILIARY DUCT SYSTEM

In their major features, the extrabiliary ducts and the gall bladder are remarkably constant. Boyden (1926) in a survey involving 10 000 domestic animals and 19 000 cadavers found comparatively few major variations. Chief among these were the following: (1) cleft gall bladders which originate by subdivision of the primary cystic diverticulum (2) diverticular bladders (vesicles or subordinate lobes which arise as buds from the neck of the embryonic gall bladder) (3) ductular bladders (supernumerary vesicles derived from either the hepatic, cystic or common bile ducts and encountered chiefly in humans) (4) trabecular bladders (vesicular outgrowths of the liver trabeculae bordering the gall bladder fossa and occurring as rare anomalies of cattle sheep and perhaps humans) (5) pancreatic bladder (a rare anomaly originating as an outgrowth from the pancreatic tissues occurring in the cat).

Embryologically the biliary duct anomalies encountered in the present study can best be explained on the basis of changes occurring in the hepatic antrum, a dilatation or vestibule at the upper end of the embryonic choledochus into which all the ducts of the liver including the cystic duct, empty. In the present series (500 cases) only 12 major anomalies of the

duct system were encountered an incidence of but 2.4 per cent. This figure is astonishingly low when compared with the large number of extreme variations in the vascular supply.

In a single specimen (Fig. 91) an accessory right hepatic duct entered the common bile duct 5 millimeters distal to the junction of the cystic and common hepatic ducts. In three specimens encountered, the common hepatic duct was wanting, the cystic duct draining directly into the right hepatic duct (Fig. 92). Three examples of an accessory right hepatic duct which drained into the cystic duct were seen. Two cases of cholecystohepatic duct in which a small accessory duct from the right hepatic lobe drained directly into the gall bladder, were met with, a small hepatic duct from the right or quadrate lobes of the liver which drained into the common hepatic duct in addition to the regular right and left hepatic ducts was encountered twice. In a single case the cystic, right and left hepatic ducts joined together at a common point of fusion so that no common hepatic duct existed.

Three modes of union of the cystic and common hepatic ducts have been described by Eusendath (1920) the angular the parallel and the spiral. All three modes of union were encountered with varying frequency in the present series but such variations were not considered as major anomalies of the duct system and were therefore not recorded.

SURGICAL COMMENTARY

The increasing number of operations performed for obstructive jaundice and biliary fistula due to man made injuries of the common bile duct and the hepatic ducts calls for a more detailed knowledge of the blood vessels in the gastrohepatic region. The degree of variation in the vascular pattern encountered in this area is of vital importance to the surgeon concerned with the techniques employed in radical pancreaticoduodenectomy. Dennis and Varco (1946) have described a case of carcinoma in the head of the pancreas associated with a hepatic artery which arose from the superior mesenteric artery and traversed the head of the neoplastic gland. Pancreaticoduodenectomy was performed an operation which necessitated resection and reanastomosis of

the hepatic artery. The patient, however, failed to survive this procedure.

Since variations in the biliary tree and its associated vascular elements are so frequent, it is advisable to identify major structures in this area before surgery is attempted. Adequate exposure is essential. Introduction of the hand between the right hepatic lobe and the diaphragm will allow air to come between these surfaces, by this means the right lobe is pushed downward into lower abdominal position. If necessary greater mobilization of the liver can be obtained by cutting the round ligament and its falciform investment between ligatures.

In the performance of cholecystectomy the cystic duct should be carefully dissected from the adjacent fibrous and fatty tissue in order to expose its full course from the gall bladder to juncture with the common hepatic duct. McWhorter (1923) is of the opinion that exposure may be facilitated by incising the peritoneum along the right side of the body of the gall bladder. Then by lifting and rotating the gall bladder to the left, it may be peeled away from the liver. The left peritoneal fold with its contained cystic arterial branches, is thus readily freed. Identification of the cystic duct and artery is often rendered difficult by adhesions and by adjacent areas of inflammation.

The observations herein recorded point to the hazard of ligating the cystic artery and duct with a single tie. The course of the cystic artery is so variable and the occurrence of dual branches so common that careful examination of the fatty tissue immediately behind the cystic duct, with separate ligation of the artery seems essential. Ligation of the cystic duct at a point 1 to 2 centimeters proximal to its juncture with the common hepatic and bile ducts is also advisable. Unless this precaution is taken, tenting of the duct with pinching of its wall by the ligature can easily result.

Jackson (1938) stated that the major cause of injury to the ducts is hemorrhage from divided cystic artery or an anomalous stump. He believes that the surest way to avoid this danger is to proceed in such a way as to identify and ligate the cystic artery before dividing the cystic duct. He feels that

because the artery frequently is anomalous in position, is often larger than expected, and is not uncommonly multiple, it is important to clamp divide and ligate all tissues of the area, as if it were actually established that such anomalies were present. In the presence of cystic arterial hemorrhage, he has outlined the steps necessary to control bleeding chiefly by means of pressure on the common hepatic trunk (with the index finger inserted into the epiploic foramen).

Elsendrath (1918) has emphasized the frequency with which the right hepatic artery lies in close approximation to the cystic duct (cf current Figs. 80 81 85 87 and 88). Such position renders the artery particularly vulnerable to injury during cholecystectomy whether the dissection begins at the fundus of the gall bladder or at the cystic duct.

In choledochotomy the common occurrence of vessels intimately associated with the common bile duct would be taken into account (Figs. 80 84, 85 87 88 89 and 93). Injury to these structures may result in troublesome hemorrhage and subsequent injury to the common bile or hepatic ducts or even in inadvertent ligation of the right or common hepatic arteries with resultant hepatic infarction necrosis and so called liver death. In recent years opinion has been divided as to whether or not true infarction and necrosis would result, in man, from ligation of the right, of the left, or even of the common hepatic artery. Certainly the major portion of blood going to the liver is carried by way of the portal system. This, however is venous blood with a low oxygen content. It is evident from the present study that before a dependable conclusion can be reached the physiological importance of the frequently occurring hepatic arteries (of both replacing and accessory types) must be determined. In any event the surgeon should ascertain whether such vessels exist before undertaking ligation of the hepatic arteries.

Variations in the duct system although rare in man can be the basis of serious and even fatal complications. Severance of an anomalous hepatic duct (Fig. 91) would result in bile peritonitis. This complication is especially likely to occur when small accessory bile ducts

drain into the cystic duct or directly into the gall bladder. Neuhoff and Bloomfield (1945) have reported two cases of cholecystohepatic duct. In one of the cases failure to ligate caused a biliary fistula of 45 days duration. One of the present authors has seen three additional instances of this anomalous duct.

The surgeon might readily encounter difficulty in identifying and exposing the common bile duct. It has been regularly taught that this structure is sufficiently avascular in its supraduodenal portion to allow safe exposure by incision through the overlying peritoneum. However the fallacy of such teaching becomes evident when it is remembered that the right hepatic artery (7 cases) or the cystic artery (17 cases) may cross anterior to the common bile duct, and that small arterial branches accompany and entwine the duct (Figs. 80 85 and 88). The frequent occurrence of a major arterial trunk situated to the right of the common duct (90 cases) calls for extreme caution in exposing the duct from this approach. Preliminary palpation, and if necessary exploration by aspiration (with a syringe and small needle) is advisable. Certainly before any procedure involving the biliary ducts is attempted, a thorough search for anomalous hepatic vessels and their branches is surgically desirable (Figs. 80 84, 85 87 and 93).

SUMMARY

1. In a study of 500 cadavers the arterial patterns and modes of variation of the common hepatic artery and its branches have been reported.

2. The relationship of these arterial trunks and branches to the biliary ducts have likewise been reviewed in detail.

3. On the basis of site of origin, the cystic artery has been classified into 12 types and their number and percentages of occurrence recorded.

4. Two rare and unusual patterns of cystic arterial variation triplication and fusion, have been presented.

5. A brief résumé has been made of the abnormalities encountered in the biliary duct system.

6. The application of these findings to the surgery of the gall bladder common bile duct,

pancreas and duodenum has been discussed. Recommendations have been made which should facilitate detection of anomalous vessels and ducts and as a consequence aid in protecting such structures from inadvertent surgical trauma.

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AIR ARTHROGRAPHY OF THE KNEE JOINT

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RECENTLY there has been a series of papers on air arthrography or pneumoroentgenography as the Americans prefer to call it, of the knee joint. This appears to indicate a revived interest in a method which is now many years old and as far as cartilage injuries have been concerned it has been the general custom to belittle. True, the experienced few have found it of great assistance but there has been no general acknowledgment of its value as an ancillary method of investigation. The conditions under which we were working suggested that its employment might be of value as owing to language difficulties the detailed history so necessary to an accurate diagnosis could not be obtained from many Indian troops. They themselves lacked the vocabulary and the observation to describe accurately what they felt, and the interpreters available acted more as a baffle than a link between the surgeon and the patient. A short cut to accurate diagnosis, if available, was thus desirable and it was decided to explore the value of air arthrography.

There was also the usual series of doubtful cases in British troops in whom positive or negative evidence by an ancillary method would be of value in helping to decide immediate disposal. In order to obtain the necessary experience in the method it was decided to submit all patients, whether or not a diagnosis could be made clinically, to air arthrography to obtain in particular the benefit of comparing the arthrographic findings with those at operation.

Commenced with open views as to its value, and in an experimental frame of mind the method, in our hands has grown to be extremely reliable, and a very valuable addition to the line of investigation. This is due in part to an improvement in technique and in part to increased experience in the interpretation of the roentgenograms. Unquestionably the most important factor in the accuracy of the

method is the quality of the roentgenogram produced, and it is probable that the poor opinion of the method often expressed is due to the defective films submitted for interpretation.

METHOD

After a 24 hour preparation of the knee, the patient is taken to the theater and, under full aseptic precautions, the joint is filled with air. As much air as possible is introduced and the quantity which can be introduced varies markedly from knee to knee the more air introduced, of course, the better the visualization of the cartilage produced. At first, an filtered room air was used and a device was arranged to introduce air filtered through cotton wool. No reaction, however having occurred in the early cases the use of unfiltered room air has been continued with no untoward results. The delay in the absorption of the air from the joint is both an advantage and a disadvantage an advantage in that filling a disadvantage in that it takes 5 days for the air to absorb and the physical signs in the joint are obscured during this period though the patient is in no discomfort. It has become our practice, however to follow the arthrography where positive by arthrotomy 2 days later thus effectively removing the air. Under local anesthesia and by means of a lateral approach to the suprapatellar pouch the joint is first emptied of any effusion, and then filled with air. At first in order to minimize discomfort, a few cubic centimeters of novocain were introduced into the joint, but it was found that there was little pain from the introduction of the air the most painful part being the infiltration of the synovial membrane with the anesthetic, and this was discontinued. It is not always as easy as it appears to enter an undistended suprapatellar pouch the size of which varies enormously from patient to patient. A small amount of effusion makes the puncture much easier but complicates the



Fig. 3.



Fig. 4.



Fig. 5.



Fig. 6.

Fig. 3 The normal lateral cartilage, anterior horn
Fig. 4 The normal lateral cartilage, middle third. Note the attachment is thinner than the cartilage

Fig. 5 The normal lateral cartilage, showing the semi-

circular shadow of the popliteus canal

Fig. 6 The normal lateral cartilage, posterior horn, showing the bifid attachment of the cartilage above and below the popliteus tendon



Fig. 7



Fig. 8



Fig. 8a



Fig. 9

Fig. 7 The normal medial cartilage, anterior horn.

Figs. 8 and 8a The normal medial cartilage, middle

third

Fig. 9 The normal medial cartilage, posterior horn

up the compartment under investigation the rays being directed roughly horizontal to the table top. The obliquity of the views is judged by eye as near as possible to those shown in Figure 2 in which it will be noticed that they vary for each meniscus. A long dental cone throwing a 5 inch diameter field at 24 inches, is used and care is taken to see that the tibial spines are included in the field. Two and a quarter seconds exposure is used with intensifying screens, and blue brand or red seal film at 15 milliamperes and 47 kilovolt peak.

NORMAL CARTILAGE APPEARANCE

Lateral meniscus. This is attached antero-laterally to the joint capsule at the level of the lower end of the femur so that the arthrograph of the anterior horn shows a large air space under the cartilage, the shadow of which passes downward and medially and tapers off evenly toward the center of the joint (Fig. 3). Laterally the attachment is a little thinner than the cartilage itself but once between the

bones the cartilage tapers off smoothly as before (Fig. 4).

Posterolaterally and posteriorly the air in the sheath of the tendon of popliteus, which separates the outer edge of the meniscus from the fibula collateral ligament, complicates the picture. The cartilage insertion appears wider and a semicircle of air concave medially is seen crossing it a little medial to its insertion (Fig. 5). More posteriorly the air shadow becomes concave laterally and lies actually in the insertion of the cartilage to the joint capsule the cartilage thus being attached by two fine bands, one above and one below the sheath (Fig. 6). In these posterior oblique views and occasionally in the true anteroposterior view the anterior horn of the cartilage may be seen curving up behind the femoral condyle and then down again as it tapers off toward its medial attachment.

Medial meniscus. The shadows thrown by this cartilage are less complicated than those of the lateral. Anteriorly the meniscus has a



Fig 10

Fig 11

Fig 12



Fig. 10a.

Fig 11a.

Fig 12a.

Fig 10. Lateral cartilage, showing central tag.
 Fig 10a. Sketch of cartilage removed at operation.
 Fig 11. Lateral cartilage with central tag.
 Fig 11a. Sketch of cartilage removed at operation.

Fig 12. Lateral cartilage showing horizontal split and nodule, with a cartilage erosion above it.
 Fig 12a. Sketch of cartilage which was removed at operation.

narrow attachment widens a little and then narrows to a point thus appearing to have an oval shape in cross-section. Passing laterally its attachment widens to the same thickness as the cartilage itself the shadow of which now tapers off smoothly across the joint. Posteriorly the attachment is wider than the cartilage the body of which tapers evenly as it passes between the condyles of the two bones.

CRITERIA OF ABNORMALITY NOTED

Lateral meniscus The complexity of the shadows cast by this cartilage until its peculiarities are mastered makes diagnosis of lesions more difficult than those of medial meniscus.

The following points were noted in connection with the abnormal lateral cartilage (1) irregularity of the cartilage surfaces (Figs 10 and 11) in cases of tags and reduced 'bucket handles' (2) additional shadows in the lateral or medial compartments of the joint (Fig 12)

in cases of displaced portions of cartilage or 'bucket handles' (3) extension or widening of the air space between the cartilage and the tendon of popliteus (Fig 13) in posterior tears (4) loss of any substance from the cartilage in displaced tears and 'bucket handles' (5) thickening of cartilage insertion to joint capsule in cases of cyst formation (Fig 14).

Lack of alignment of lateral edge of femoral and tibial condyles is common and is not considered by us of any diagnostic significance.

Medial meniscus The following points are noted in connection with the medial meniscus (1) loss of substance from the cartilage with or without extra shadows in the medial compartment of the joint indicating displaced 'bucket handle' (Figs. 15 and 16) (2) irregularity of either surface of the cartilage (Fig 17) (3) fine linear air spaces in the cartilage indicating undisplaced tears which may be partial or complete (Fig 18) (4) thickening of the



Fig. 13.



Fig. 14.



Fig. 5.



Fig. 5a



Fig. 6.



Fig. 7



Fig. 7a



Fig. 8.



Fig. 9

Fig. 3. Extension of the normal air space, with loss of attachment of the posterior third of the cartilage.

Fig. 14. Cyst of external cartilage.

Figs. 5 and 5a. Loss of substance of the medial cartilage.

Fig. 6. Loss of substance of medial cartilage with central "bucket handle" visible.

Figs. 7 and 7a. Irregularity of the surface of the medial meniscus.

Fig. 8. A fine linear tear in the substance of the cartilage.

Fig. 9. Displaced tag of cartilage visible and palpable between the attachment of the cartilage and the tibial plateau. A discolored cartilage not well shown.

insertion as in the lateral cartilage indicating cyst formation (5) increase in distance between meniscus and articular cartilages peripherally indicating ligamentous rupture (Fig 20)



Fig. 20.



Fig. 20a.

Fig. 20. Rupture of medial collateral ligament showing escape of air round both upper and lower attachment.

Fig. 20a. Rupture of the medial collateral ligament, showing escape of air round its lower attachment.

Air arthrography by throwing up the shadows of the normally invisible cartilaginous layer on the condyles makes possible the diagnosis of cartilaginous damage with which no

bony damage is associated (Fig 12) This may be of value in early traumatic arthritis, and would produce a more convincing picture of the early stages of osteochondritis dissecans.

A few cases of rupture of the collateral ligaments of the knee have been arthrographed information of some value as to the site of rupture of the ligament and the question of associated cartilage damage may be obtained. The surgeon who considers operation advisable in those cases in which the rupture is severe and permits more than slight opening of the joint, will gain considerable information as to the level of the rupture (which may be at the tibial attachment, the femoral attachment opposite the joint line or scattered through different layers at different levels) and so be able to center his incision more accurately.

Sufficient work has not yet been done to obtain the full roentgenological picture in the various types of rupture, but we believe this has interesting possibilities.

In intra articular fractures, the method has not been used owing to the danger of air embolism when cortical bone is opened up.

CASES IN WHICH AIR ARTHROGRAPHY IS UNLIKELY TO BE OF VALUE

As air arthrography only shows the shadow of the cartilage, detachments of the anterior and posterior horns in which the shape of the cartilage remains the same may be overlooked. These conditions are, however, rare, and the so called 'hypermobile cartilage' is a lesion which it is difficult to prove scientifically and which must be carefully considered as it proves such an easy refuge for the careless surgeon. One case in our series had a detached anterior horn held in position by the soft tissues which was not diagnosed together with a hypertrophic fatty pad.

Hypertrophic fatty pads are also impossible to diagnose roentgenologically but a normal cartilage, shown by air arthrography together with the characteristic story of giving without locking click or severe reaction may assist in a preoperative diagnosis. The knowledge that the posterior half of the cartilage is normal is also of value in giving the surgeon confidence in a decision to leave the cartilage behind when no cartilage lesion is found at operation.

and there is some doubt whether the fatty pad lesion is the cause of the trouble.

Very fine 'bucket handle' tears may be difficult to visualize, but we have demonstrated lesions where the 'bucket handle' was no more than $\frac{1}{8}$ inch thick. Small tags have also been shown (Fig 10) but it is admitted that their successful demonstration depends to some extent, on their position and it would be possible to overlook them. We have shown that the transverse tear, more often operative than traumatic, may be demonstrated.

RESULTS

The object of this article has been to prove the case with which satisfactory views of the menisci can be obtained by arthrography and particularly with the technique described and their value in diagnosis. The accurate relationship of the method to diagnosis, from a statistical viewpoint, is however, very hard to prove and with the limited number of cases available to us can only lead us to very general conclusions. It is manifestly impossible to submit all negative findings to operation it is in the negative cases that the possibility of roentgenological error remains unchecked.

RESULTS IN 75 CASES ARTHROGRAPHED

Ruptured medial collateral ligaments	3
Cysts of the external cartilage, with tears	3
Clinically and roentgenologically torn, refused operation	3
Clinically torn, roentgenologically confirmed operatively torn	35
Clinically doubtful, roentgenologically proved, operatively torn	5
Clinically torn, roentgenologically normal, operatively torn	3
Clinically doubtful, roentgenologically negative operatively normal	2
Clinically doubtful, roentgenologically negative, operatively torn	2
Clinically doubtful, roentgenologically negative, hypertrophic fatty pads	2
Clinically doubtful, roentgenologically negative, returned to unit	17

Thus in 44 out of 49 cases operated upon the roentgenological findings were confirmed operatively. In two of these a negative arthrography was confirmed by the discovery of a normal cartilage, and the presence of a degenerative arthritis. These 2 cases occurred in the early stages of the investigation when due weight was not given to the roentgenolog-

ical findings, which in these cases would have enabled one to avoid an undesirable operation. In 2 other cases the clinical findings were considered to justify operation, in spite of a negative arthrography. In both cases, a normal cartilage was found, and a hypertrophic fatty pad was apparently the cause of the symptoms. One of these was cured by the excision of the fatty pad alone the knowledge that the cartilage was normal roentgenologically giving us confidence in leaving the cartilage in place.

Roentgenological errors occurred in 5 cases. In 2 very small anterior tears were found at operation, though the arthrograph was regarded as normal. In 1 later case, a posterior third tear of a meniscus (lateral) was found. In the remaining 2 cases, tears were diagnosed and at operation nothing but a hypertrophic fatty pad was found. These 2 cases again occurred early in the series when our technique and experience were not developed. In the later cases, our accuracy of roentgenological diagnosis became almost complete.

Every surgeon removing a series of cartilages will admit to some degree of inaccuracy of diagnosis. In our case, this was 8 per cent when unassisted by arthrography. Some of these cases made a clinical recovery which may be accounted for by a hypermobile cartilage, or some other unappreciated factor. It is quite clear that if surgery were limited to roentgenologically positive cases, one hundred per cent accuracy could be obtained but, owing to an occasional failure of the method to show a small tear or a hypertrophic fatty pad, this is not possible. After experience of arthrography we increased the accuracy of diagnosis so that in the 49 cases in which operation was done, only 2 normal cartilages were removed, and both errors would have been avoided if the roentgenograms had been believed, while in the last 39 cases, 100 per cent accuracy has been achieved.

Interesting points raised by arthrography have been

1. The ability to diagnose an early doubtful lesion without waiting for a confirmatory recurrence of trouble, so often recommended as the best procedure. We believe that where a definite "bucket handle" lesion or posterior third tear is shown immediate removal of the

cartilage is justifiable, and thus completes patient's treatment in one stay in the hospital.

2. The frequency with which tears are present in association with cysts of the lateral cartilage has been well shown by the method.

3. A surgeon is given confidence to leave a cartilage in position when exploring a knee for a doubtful lesion, if he discovers a hypertrophic fatty pad which may reasonably be responsible for the symptoms.

4. The increased accuracy of diagnosis of lesions of the fatty pad when the cartilage can be proved normal.

It is, we think, safe to say that air arthrography is a simple procedure devoid of risk, when correctly carried out and that it is a valuable ancillary method of investigation increasing the accuracy of preoperative diagnosis very considerably and capable of raising it to one hundred per cent correct. Practiced as a routine it provided that background of experience in the method, so necessary in the interpretation of difficult cases. It is of particular value in (1) cases in which no adequate history is available (2) cases in which the clinical findings are inconclusive, both as to site of the lesion or its actual presence (3) cases in which a double lesion is suspected either a double tear or a cyst and tear (4) cases in which ligamentous laxity might account for the symptoms, and it is required to prove or disprove associated cartilage damage.

SUMMARY

1. A new technique for air arthrography of the knee is described.
2. The appearances of the normal lateral and medial cartilages are described.
3. The findings in cases of abnormal cartilages are detailed.
4. A summary of the results in 75 cases is given with the clinical conclusions.
5. The accuracy of preoperative diagnosis is considerably increased, and 100 per cent accuracy can be achieved if only roentgenologically positive cases are submitted to operation. As we believe the method incapable of demonstrating lesions other than tears and damage to condylar cartilage a few roentgenologically negative cases must be submitted to operation to introduce a possibility of error

TRAUMATIZED MUSCLE TISSUE AS A FACTOR IN THE PRODUCTION OF SHOCK

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THE physiological and the pharmacological action of extracts of fresh tissue and the products of tissue decomposition has been studied for over half a century, but the part that these extracts play in shock resulting from trauma is still the object of much controversy. The conflict of opinion concerns the possibility of a systemic reaction resulting from toxic substances liberated at the site of injury.

Those supporting the theory that shock resulting from traumatized tissue is due solely to the local loss of fluid have denied the possible absorption from injured tissue (6, 8, 17, 18, 19, 20, 21). However we now have sufficient evidence to prove that absorption from traumatized areas does occur (5, 7, 15, 16). Also the sequence of events which occurs in the 'crush syndrome' demonstrates the absorption from crushed muscle tissue.

Granting that absorption from traumatized tissue does occur, are the products of tissue disintegration sufficiently toxic to contribute to the production of shock? The confusion which has resulted from the numerous investigations of this problem is apparently due to the failure to distinguish the difference in the action of the three types of tissue extract: (1) fresh tissue extract, (2) autolyzed tissue extract, and (3) tissue extracts containing bacterial metabolites. In our experimental study we have determined blood pressure response to the use of the three types of tissue extracts.

All the records in these experiments were obtained from dogs varying in weight from 10 to 20 kilograms. They were anesthetized with sodium pentobarbital (nembutal) approximately .03 gram per kilogram body weight, injected intravenously and additional injections were made as necessary to maintain the anesthetic level. Blood pressure records were ob-

tained by cannulating the right carotid artery and connecting the cannula to a mercury manometer by means of rubber tubing. The entire system was filled with sodium citrate solution. The respiratory movements were recorded by securing a stethograph drum to the chest.

FRESH TISSUE EXTRACT

Muscle tissue was obtained from dogs under nembutal anesthesia, and the tissue was removed from the thigh and gluteal regions. Care was taken to remove only muscle tissue, in so far as it was possible, and ordinary precautions were taken to prevent the introduction of outside contaminating factors. The muscle tissue was immediately cut into smaller pieces and ground in a meat chopper. One volume of physiological saline solution was added to one volume of the ground muscle tissue; the mixture was put into an Erlenmeyer flask, stoppered, and thoroughly mixed. The muscle-saline preparation then was kept at icebox temperature, approximately 5 degrees centigrade; subsequently it was filtered through several thicknesses of gauze and the filtrate was used for intravenous injections.

Figure 1 is a record of the result obtained from the injection of the saline extract of fresh muscle tissue. It will be observed that the intravenous injection of 1, 2, 4, and 8 cubic centimeters of such extract had little if any effect on the blood pressure. This result may be duplicated repeatedly provided the muscle extract is prepared so as to contain a minimum of fat and particulate matter, and the injections are given in graduated doses. These precautions will prevent the formation of emboli and thrombi (9).

AUTOLYZED TISSUE EXTRACT

The subject of tissue autolysis received renewed interest some years ago when it was demonstrated that a small piece of sectioned

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Fig. 2

liver tissue free within the abdomen would cause death in 15 to 18 hours with the classical symptoms of shock, including hemoconcentration (2, 4, 10-14). Since that time numerous investigators have studied the subject and more recently a comprehensive study of "Tissue Autolysis and Shock" (1) has appeared.

Figure 2 is presented to demonstrate the effect of the intravenous administration of saline extract of muscle tissue which has been subjected to conditions favoring autolysis. The ground muscle with an equal volume of physiological salt solution containing penicillin (more than 30 units per cubic centimeter) was incubated for 17 hours, filtered through gauze and administered. The doses were the same as



Fig. 3

in Figure 1 and the effect was practically identical with that obtained from the fresh muscle extract. We have repeated these observations, allowing the material to incubate as long as 7 days and none of the preparations proved to be markedly toxic. One is forced to conclude that either penicillin prevents the autolysis of muscle tissue or that autolysis of muscle tissue does not produce a toxin sufficiently abundant or active to induce shock.

TISSUE EXTRACTS CONTAINING BACTERIAL METABOLITES

The material for this part of the study was prepared by incubating the ground muscle which had been diluted with an equal volume



Fig. 4

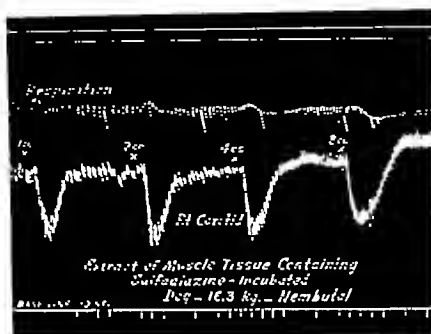


Fig. 4.

of physiological salt solution no antiseptic was added. Figure 3 shows a record obtained during the administration of 1, 2, 4, and 8 cubic centimeters of the filtrate from a preparation which had been incubated for 17 hours. It will be observed that each injection produced a definite fall in blood pressure followed by a sharp rise, the rise often producing a blood pressure nearly twice that of the original. The blood pressure response is practically identical with that previously reported (12) when we used extracts of liver tissue which had been sectioned and left free within the abdomen for 15 to 18 hours. Comparing the blood pressure response recorded in Figure 2 with that recorded in Figure 3, one is impressed with the marked difference; the preparations used were incubated the same length of time and were identical except that penicillin was added to the former before incubating.

The following experiment was undertaken with the desire to determine the concentrations of penicillin necessary to prevent the formation of the toxic material which resulted from incubation. Graduated amounts of penicillin were added to the contents of 10 Erlenmeyer flasks, each containing 50 grams of ground muscle and 50 cubic centimeters of physiological solution. The preparations were thoroughly mixed by shaking and then incubated for 48 hours. Table I is a record of (1)

the amount of penicillin used, (2) the presence or absence of gas and odor, and (3) the blood pressure response to the injection of 4 cubic centimeters of the filtrate obtained from the contents of each flask.

TABLE I

Flask	Units penicillin		Gas and odor	Blood pressure drop to 4 c.c. injection
	Total	Per		
	50,000	500	Neither	None
	5,000	50	Neither	None
3	500	5	Neither	None
4	650	65	Neither	None
5	25	2	Neither	None
6	1,550	6	Neither	None
7	780	8	Gas	26 mm.
8	390	4	Gas	6 mm.
9	95		Gas and odor	54 mm. (with sec. rise)
10	97		Gas and odor	Not injected

Desiring to test the effectiveness of sulfadiazine, we added an excessive amount to the muscle-saline mixture, 1 gram to 250 cubic centimeters, mixed thoroughly and incubated for 17 hours. Figure 4 demonstrates the effect of the intravenous injection of 1, 2, 4, and 8 cubic centimeters of the filtrate. It will be noted that the amount of blood pressure reduction resulting from each injection was es-

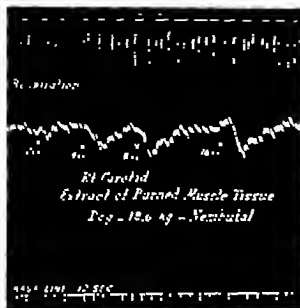


Fig. 5

scially the same, approximately one half of the original pressure regardless of the amount of injected material. No secondary rise in blood pressure occurred as observed in Figure 3

BURNED TISSUE EXTRACT

A weighed amount of ground dog muscle was placed in a dry clean (grease free) frying pan and heated. The degree of heat and the length of time were varied depending upon the degree of burning desired. All degrees of burning were studied from cooking until the pink color disappeared from the center of the mass to charring the entire muscle tissue. The burned tissue was placed in an Erlenmeyer flask and treated with a volume of physiological salt solution equal to the original muscle mass. It was then shaken thoroughly and kept at icebox temperature until used, at which time it was filtered and the filtrate injected intravenously.

The intravenous administration of the filtrate obtained from the saline extract of burned muscle tissue usually produced little if any change in blood pressure. Figure 5 is a record obtained during the injection of 2, 4, 8 and 16 cubic centimeters of such a filtrate. The dose given is double that which was used in the previous records and the response is not marked.

CONCLUSIONS

1. Extracts of fresh muscle tissue, administered intravenously produced little if any change in blood pressure.
2. The use of the filtrate obtained from ground muscle incubated with penicillin also produced little change in blood pressure.
3. The filtrate of muscle tissue incubated with sulfadiazine produced a marked lowering of blood pressure, the drop being equal to approximately one-half of the original pressure.
4. Extracts of muscle tissue incubated without the presence of any antiseptic produced a fall in blood pressure followed by a secondary rise. The increased blood pressure was often double the original pressure.
5. The blood pressure response to incubated muscle tissue, without an antiseptic, is practically identical with that we have previously reported when using extracts of liver tissue sectioned and left free within the abdomen.
6. Administration of the saline solution extract of burned fresh muscle tissue produced little if any change in blood pressure.

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AN IMPROVED PERMANENT COLOSTOMY

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THE prospective owner of a permanent colostomy must view his future with awe. Nevertheless the early repugnance with which patients regard their disability is usually replaced by a sense of the inevitable. The possible cure of a foul disease seems to lend them support to maintain a tolerable existence.

Apart from the infrequent surgical complications of stenosis and prolapse however expert may have been the performance of the operation, there remains the imperfection that the colostomy in regard to fluid loss and gas is uncontrollable, even artificially. Rubber bags, obturators of various kinds, complicated, and therefore cumbersome, colostomy cups have all had their day and have been found wanting in many ways. The mucous membrane of the colon will not withstand plugging for any length of time and so far as we are aware any attempt to control the efflux of feces in this way has failed. It has been established beyond question that the best fashioned colostomy is a severe domestic and social embarrassment.

It occurred to one of us (JOS) while observing the other (B.K.R.) constructing buried inverted skin tubes for a cineplastic forearm amputation, that a similar type of skin tube might be made as the terminal segment of a colostomy with some prospect of the successful use of a mechanical plug.

In adapting this suggestion it was ultimately decided that the appropriate surgical procedure would best be designed and executed in two stages. This for two reasons.

1 To avoid stricture formation. Areas in relation to the anastomosis of skin tube with bowel cannot be left prone to secondary intention healing and scar formation. This is more easily achieved if the skin tube is made and healed as a primary procedure before any attempt at mucocutaneous anastomosis. Only in this way can new suture lines meeting in divers planes and directions be avoided. Such

are always vulnerable points, even in favorable circumstances, but in association with fecal contamination rarely could effective primary healing be expected.

2 To avoid increase of operation risk. Patients mainly of the upper age group, after a preneobdominal operation for excision of the rectum are generally unfit to withstand the extra time of a tedious plastic operation. Moreover patients in low ebb of vitality are poor subjects in which to embark on plastic procedures which at least require a healthy peripheral circulation.

Using variations of common principles our object was successfully accomplished by one of us (B.K.R.) in 3 cases with an evolution of method and success. Without expounding details which were tried and the difficulties encountered the method used in the third case will now be described as a prototype operation in relation to Figure 1.

STAGE I

Construction of a buried inverted skin tube. A rectangle of skin $ABA'B'$, approximately 2 by 4 inches is designed (Fig. 1a) on the lower left quadrant of the abdomen. The center of its upper and long side is at a point lateral to the rectal sheath where the bowel is to leave the abdomen. This skin area will line the tube. The ends only of the rectangle are raised as two separate flaps of skin and fat (Fig. 1b) each flap containing slightly less than one third of the rectangular area. When each of these flaps is turned back on its attached base the free ends are sutured together to make a skin lined tube (Fig. 1c). Silk is used for this suturing. Separate inverted end-on mattress sutures are used at either end of the tube, and a continuous subcuticular mattress stitch along its length. The latter is anchored at either end to the single stitches and left long for identification purposes.

There now remains a raw surface corresponding to the area of the original rectangle

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marked out. This surface is covered by a flap of appropriate dimensions transposed from the region CDEF on an oblique base CD (Fig 1d). This is a "safe" flap. When transposed to the raw area (Fig 1e) its center portion will overlap the outside of the skin tube. Its whole free margin is sutured to the defect. This means that the central parts of its long margins are sutured to the free skin circumference at each end of the skin tube. Interrupted stitches of fine silk are used for this purpose.

This completes the skin tube but leaves a secondary defect in the left loin. In some subjects with a loose abdominal wall, after wide lateral undermining it is possible to close the secondary defect by direct suture (Fig 1f, A). In others it is better closed by a large rotation advancement flap (Fig 1f, B). This flap serves a twofold purpose in distributing tension over a long suture line and transferring maximum tension to a remote region of relatively no importance.

STAGE 2

Anastomosis of the bowel end to the skin tube.

Skin incisions WXYZ are made (Fig 1g) including a ring incision around the proximal circumference of the skin tube. Turning back the flaps WXY and WXZ (Fig 1h) the abdominal is now opened as through a muscle splitting incision. The free end of the bowel tied with a tape during the main abdominal operation is delivered through this wound leaving sufficient length for subcutaneous anastomosis to the skin tube. After trimming the bowel end is anastomosed to the skin lining of the tube (Fig 1i) with many interrupted catgut stitches including some inverted mattress stitches. The skin wound is now closed so that the flaps WXY and WXZ now lie anterior to the bowel, the line XY and the line XZ are outside the line of mucocutaneous anastomosis and X meets X (Fig 1j). The final scars of surface suture lines are either as marked in Figure 1k or 1l, according to the manner in which the secondary defect was closed in Stage 1.

SUMMARIES OF CASE REPORTS

CASE 1 (Lt. Col. Smith's patient.) Bdr J H., aged 35 years, had a fungating carcinoma of the rectum

with papillomatosis. His operation program was as follows:

Operation 1 was performed May 15, 1944 under local anesthetic. A buried inverted skin tube was made (Stage 1). Primary healing followed.

Operation 2 was performed June 16, 1944, under general anesthesia. Excision of rectum and lower sigmoid were done by the combined approach (Lt. Col. Smith and Major Ackland). Bowel skin tube anastomosis was made (Stage 2). The mistake was made of not joining the iliac wound to the marginal incision around the skin tube opening. The bowel anastomosis was not buried, and there was a bridge of abdominal skin beneath the exposed bowel. At this stage there was no colostomy opening other than by the skin tube, but a days later the bowel was opened to function as a colostomy on its exposed portion above the skin tube anastomosis. After this, the mucocutaneous anastomosis became detached.

Operation 3 was performed August 9, 1944 under general anesthesia. Reanastomosis of bowel to skin tube was done. This time the anastomosis was buried by raising the bridge of skin between the iliac wound and skin tube and by laying the bowel beneath it. This was distal to the now functioning colostomy. This anastomosis remained clean and healed.

Operation 4 was performed August 21, 1944 under general anesthetic. Closure of colostomy and barial of exposed bowel were done. A large Eastlander type skin flap was used. There was a good deal of pain and distention following this operation but after a purgative, the bowel discharged freely through the skin tube. Three small fistules then developed in the suture line proximal to the skin tube. Two of these healed rapidly, and spontaneously the third eventually closed.

On November 10, 1944, all was well healed, and he commenced to plug intermittently the skin tube with dental rolls. An acrylic plug was later supplied him.

On July 10, 1945, when last reviewed, the skin tube colostomy was clean and easily manageable. His bowel opens in the morning after which he plugs the skin tube with an acrylic plug retained by a belt. He complains of occasional wind and distention. A finger could be easily passed up the skin tube into the bowel without any suggestion of stenosis.

Photographs of this patient are shown in Figure 1k.

CASE 2 (Lt. Col. Remou's patient.) Cpl. C.F.N. aged 41 years, had an ulcerating carcinoma of the rectum. His operative program was carried out as follows:

Operation 1 was done August 8, 1945, under local anesthesia. Buried inverted skin tube was made (Stage 1). Primary healing followed.

Operation 2 was performed August 23, 1945 under general anesthesia. Combined abdominoperineal excision of the rectum (Lt. Col. Remou and Major

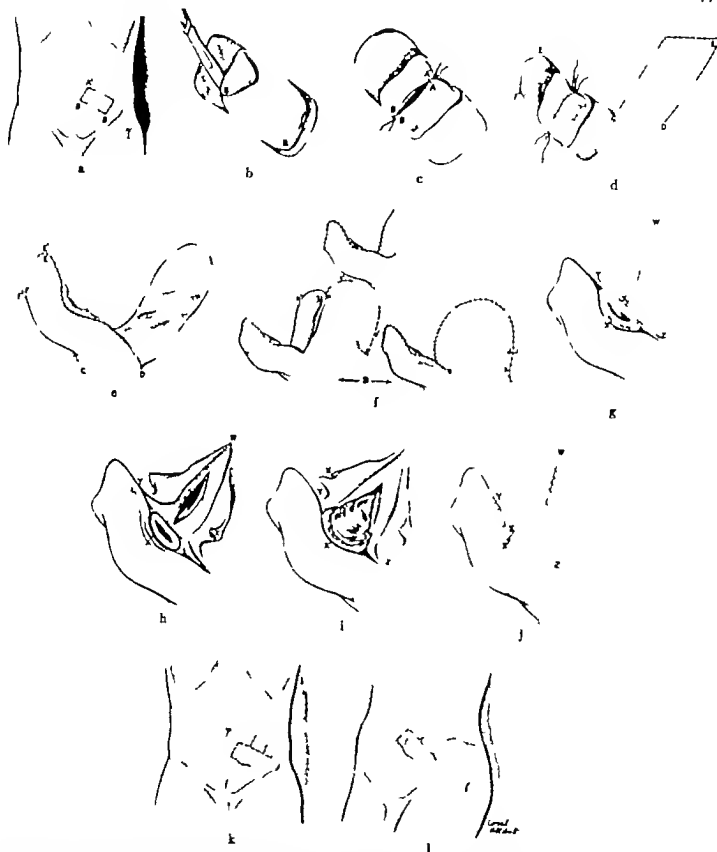


Fig 1. Prototype operation. Stage 1: a. Rectangle of skin designed. b. Ends of rectangle raised as two separate flaps. c. Flaps sutured together. d. Flap designed to cover raw area left by making of tube. e. Transposition of flap. f. Methods of closure of secondary defect. Stage 2: g. Skin

incisions made for anastomosis of bowel end to skin tube. h. Flaps turned back from these incisions. i. Bowel end anastomosed to skin lining of the tube. j. Closure of wounds. k, l. Final scars of suture lines, according to method of closing the secondary defect.

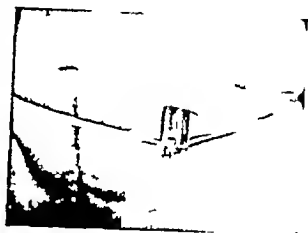
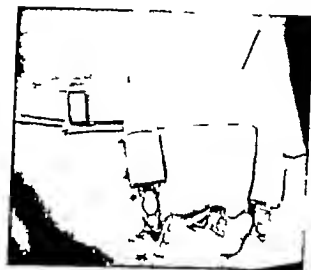
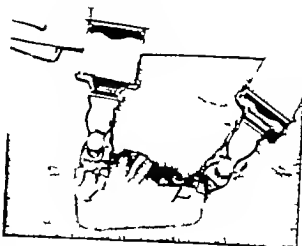
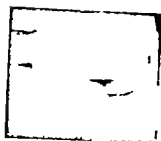


Fig. 2. Method of plugging. a, Case 1. b, Case 2. c, Case 3.

Blackay) was performed. Buried anastomosis was made of bowel to skin tube. Proximal to this the bowel was left uncovered by skin and was opened.

Operation 3 was done, September 24, 1945 under local anesthesia. Closure of a fistula was made at site of partial breakdown of mucocutaneous anastomosis. This too subsequently broke down. It was difficult to prevent feces getting into the bowel distal to the colostomy opening despite many types of dressing and packing.

Operation 4 was performed October 13, 1945 under local anesthesia. Transverse colostomy.

Operation 5 was performed November 3, 1945 under local anesthesia. Closure of recurrent fecal fistula in mucocutaneous anastomosis. Closure of distal colostomy. After this all wounds remained healed.

Operation 6 was performed November 21, 1945 under general anesthesia. Closure of transverse colostomy was done. On December 3, 1945 he started to use a plug in the skin tube.

On July 1946 when last reviewed, colostomy was clean and easy to manage. He is in the habit of inserting a plug after his bowel action in the morning. He has good bowel habit and control and gets sensation of fullness when the plug is in situ with the bowel full. He is using a plug made with a wind vent as in Figure 3.

This case is illustrated in Figure 2b.

CASE 3. (Major Blackay patient) Pte J. P. H. aged 54 years, had a carcinoma of the rectum. His operative program was as follows:

Operation 1 was performed September 26, 1945 under general anesthesia. Laparotomy and transverse colostomy were carried out. Construction of buried skin tube was made (Stage 1). Four days later the transverse colostomy was opened. The main operation was postponed for some time because of a cardiac condition indicating special treatment.

Operation 2 was performed December 3, 1945 under spinal and gas anesthesia. Abdominoperineal excision of rectum was done (Lt. Col. Renou and

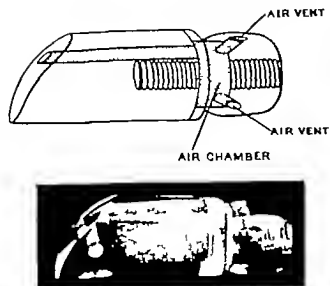


Fig. 3 Acrylic plug with wind vent. Model as used in Case 2

Major Mackay) Distal free end of sigmoid anastomosed to proximal end of skin tube and buried subcutaneously as described in stage 2 of prototype operation. This healed *per primam*.

Operation 3 was January 31, 1946 under local anesthesia. Closure of transverse colostomy extra perineal, was done.

On February 1, 1946 the skin tube colostomy commenced to function and has continued satisfactorily since. An acrylic plug was made and fitted which at first caused some difficulty because of the persistently fluid nature of his feces.

On June 1, 1946 patient was fitted with a new type of plug which he was managing well.

This patient (Fig. 3c) subsequently developed recurrence of growth in the perineal wound. He became bedridden and though he abandoned use of the plug the skin tube colostomy remained clean and functioned well, despite repeated bouts of diarrhea.

In Cases 1 and 2 we failed to achieve primary healing in the anastomosis of bowel to the skin tube. There was breakdown with fecal fistulas at the junction line. In the first case it is still to be wondered that spontaneous healing—though delayed—did occur. In the second case the fistulas were only closed after



Fig. 4 External appearance of the skin tube colostomy of over 2 years standing. The photograph shows the skin in good condition. There has never been any skin irritation or breakdown.

a secondary transverse colostomy was done to break the fecal flow. In the third case where preliminary colostomy had been done so that the original anastomosis at the end of the major operation for rectal excision was done on a defunctioned bowel the optimum of primary healing was obtained.

On this experience it is our considered opinion that the anastomosing procedure is best attempted only on a defunctioned bowel despite the disadvantage of the extra stages it involves. The best initial procedure is a limited abdominal exploration with transverse colostomy. It is not our purpose at this juncture to argue whether formal exploration should be dispensed with or not, but rather to state that a transverse colostomy is the essential preliminary to an efficient mucocutaneous anastomosis later.

In relation to an elective operation for rectal excision as for cancer we consider the operative program to achieve a skin tube colostomy in the safest and most satisfactory way should be in three stages.

Operation 1 (a) laparotomy, (b) construction of buried skin tube (Stage 1) (c) transverse colostomy.

Operation 2 (a) abdominoperineal excision of rectum (b) buried anastomosis of terminal bowel end to skin tube (Stage 2)

Operation 3 closure of transverse colostomy

THE PLUG

The main purpose of the operation implies the use of an efficient plug to render the colostomy controllable. At first dental rolls of packed wool were used. These were too easily and rapidly forced out and it seemed that some retention arrangement was necessary. Various types of rigid acrylic plug and retention arrangements have been made and tried including one to allow wind escape (Fig. 3). The patient in Case 2 uses this effectively, but finds it difficult to keep clean. Some soft material (such as polyvinyl) or the use of an inflatable cuff with some attempt to shape the skin tube may be the indication.

Many more cases require to be done before any definite conclusions can be made of the value of such a colostomy including further work and elaboration on the best medium, means, and routine of plugging the skin tube.

We regard this only as a preliminary report warranted by the establishment of a new prin-

ciple in colostomy which we have demonstrated as a practical proposition. We do not believe that the principle should be applied to all cases of colostomy. It appears desirable in such a patient as our first case, a man 35 years old with the prospect of many years of life before him but condemned to an artificial anus. Our longest standing case of over 2 years has shown that the skin tolerates both feces and plugging with no untoward effect (Fig. 4). When the colostomy is plugged a sensation of local fullness in the region is experienced when the bowel is full. The skin tube colostomy can be easily kept clean and is altogether a more controllable and more manageable proposition than the standard types of colostomy.

With appropriate teamwork the necessary procedures can be carried out without added risk to the subject and with no undue upset of the main plan and procedures necessary to operation.

AN EVALUATION OF ABDOMINAL WOUND CLOSURE

Steel Wire Layer Closure Compared with Catgut-Silk Layer Closure, Early and Late Results

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CONSIDERABLE controversy still exists among surgeons in the choice of suture material and the method of closure of abdominal wounds. We wish to present a method of abdominal wound closure which, though not new, has so decreased our early and late wound complications as to bear emphasis.

Two hundred twenty celiotomy wounds were studied, 110 of these were closed with a catgut-silk combination, and 110 were closed with a steel wire-silk combination.

The patients studied present a rather severe test of wound closure. All belong to an economically indigent group derived from rural areas. One hundred and fifty nine patients had some type of abdominal cancer. The average age of the entire group was 58 years. In this hospital approximately 45 per cent of the patients upon whom major surgery is performed have a total serum protein on admission below 6.3 grams per cent and about 90 per cent show a decline in their serum protein postoperatively despite vigorous protein therapy (10). A high incidence of marked weight loss (9) and frequently a moderate to severe anemia on admission are common findings. Because of these adverse factors it is mandatory that every effort possible be made to prevent the development of postoperative complications. As has lately been re-emphasized (8) a high degree of control of all possible factors in surgery on such patients is essential if success is to be attained with regularity. The use of steel wire in closing abdominal wounds as described later has provided an additional safety factor. A careful follow up of all patients makes it possible not only to observe the early but the late wound complications.

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The suture materials used in this study have included catgut, silk, cotton, and steel wire. Large has shown a decreasing tolerance to suture material in the following order: fine stainless steel wire, cotton, silk, plastigut, nylon, and catgut.

The method of closure for those patients in whom catgut and silk were used was as follows: The peritoneum was closed with a continuous No. 1 chromic catgut stitch. The other layers—fascia, subcutaneous tissue and skin—were approximated with interrupted silk sutures. Approximately one-third of these wounds (35 per cent) were reinforced with silkworm gut stay sutures through the skin, subcutaneous tissue, rectus muscle, and anterior rectus sheath.

The method of closure in the group in which steel wire and silk were employed is essentially the same as that used by Louis Sneed and described by Jones. We have modified it inasmuch as we use interrupted fine silk or cotton to close the subcutaneous tissue and interrupted silk or cotton to approximate the skin. The wire used is an alloy steel wire (No. 28 or 30). We have noted that if a finer grade than No. 30 is used it has a tendency to cut the tissues. At present we prefer the heavier grade No. 28. The alloy steel wire stitch goes through both layers of the rectus sheath, the intervening muscle, and the peritoneum. The stitch is then brought out through all of these layers on the opposite side of the wound and a second loop is taken to approximate the anterior fascial layer of the rectus sheath (Fig. 1). Recently we have noted that at times precise apposition of the peritoneum did not always result with this technique. Accordingly we now incorporate a loop through the peritoneum and the rest of the stitch is taken as described (Fig. 2). Before placing the anterior fascial loop the stitch



Figs. 1 and 2 Method of closing abdominal wound.

is drawn snug apposing the peritoneum. Deep bites of tissue are taken (1.5 to 2.5 cm.) on each side of the wound to add strength to the closure during the initial postoperative period and to provide more cushioning, and therefore less strangulation of the tissues. The stitch is drawn snug and a double square knot is then tied about 1 centimeter above the anterior fascial sheath. Approximation of the wound is all that is needed and when the suture is released it lies loosely in the tissues. A tightly drawn suture will cause wound edema or even ischemic necrosis. The later complication has not been observed at this hospital. After they are tied the wires are cut flush with a hemostat placed just above the knot. The hemostat is then rotated so that the cut ends of the wire are turned downward. This is particularly important in individuals with little subcutaneous fat, otherwise the sharp ends may impinge on the under surface of the skin and cause pain. This method of wound closure does not eliminate the necessity for careful asepsis and hemostasis. We believe it promotes gentleness in the handling of tissues as one stitch approximates the peritoneum rectus sheath and muscle.

The complications encountered with these two methods of abdominal wound closure consisted of 37 (3.36 per cent) in the catgut-silk group and 8 (0.07 per cent) in the wire-silk group. Five minor wound infections occurred in the catgut-silk group and 6 in the wire-silk group. Four major infections occurred in the former group and none in the latter group. Of the wounds which became infected in the catgut-silk group 3 were classified as potentially contaminated at the time of operation. In the wire-silk group 1 was classified as potentially contaminated at operation.

Dehiscences are divided into major and minor the former term being used when the wound separated to the peritoneum from within or to the skin from within the latter when only skin and subcutaneous tissue separated. There were 2 minor and 5 major dehiscences in the catgut-silk group, and none in the wire-silk group.

The term eventration is used only when there was actual protrusion of abdominal viscera through the wound. The incidence of eventrations in the 158 cancer patients in both groups was 1.8 per cent. This is in keeping with the findings of others. Glenn and Moore reported an incidence of eventration of 1.39 per cent in patients with malignant disease and of 0.51 per cent in patients without malignant disease. The 3 eventrations occurring in this study were in the catgut-silk group and as is seen in Table I they are all in patients with cancer. One of the patients in whom evisceration occurred subsequently died in the hospital of peritonitis. An added initial strain was placed on the wound in most of the patients in the steel-wire group inasmuch as they were gotten up on the first or second postoperative day. However in spite of this there were no dehiscences or eventrations. In the nonmalignant conditions also fewer complications occurred in the steel-wire-silk group.

A study of the late results shows 12 postoperative incisional hernias in the catgut-silk group and none in the wire-silk group. In the catgut-silk group there were 36 and in the wire-silk group 35 patients who had cancer of the rectum or the lower sigmoid, requiring permanent colostomies. In the catgut-silk group the permanent colostomy was customarily brought out through an accessory muscle splitting incision in the left lower quadrant.

In the wire-silk group the colostomy was brought out through the original left rectus muscle splitting incision. In the 36 patients in the catgut-silk group 11 developed hernias about the colostomy. In the 35 patients in the wire silk group 3 developed hernias about the colostomy. Two of these were loop colostomies. Because of the subsequent atrophy of the defunctionated distal limb a disproportion not infrequently develops between the wound opening as originally made and the bowel. Accordingly it is not uncommon to find late herniation about loop colostomies regardless of the type of wound closure. At the present time almost all colostomies both permanent and temporary are brought out through the rectus muscle splitting abdominal incision. The wounds have healed per primam, and in temporary colostomies the closures have been accomplished without difficulty or wound weakness.

One painful incision occurred in each group. The one in the catgut-silk group was not relieved by excision of the painful scar and the one in the wire-silk group was not relieved by removal of the wire stitches. Both patients were considered to be hyperesthetic individuals in other respects.

There were 4 instances of sinus tract formation in the catgut-silk group as compared to 1 in the wire silk group. Jones also observed a low incidence of sinus tract formation following the use of buried alloy-steel wire.

In the presence of infection or gross soiling we feel that steel wire employed in the manner described is the suture material of choice. Since the above investigation was made we have had 1 patient who had a colostomy and developed postoperative intestinal obstruction. At the time of operation after release of the obstruction there was inadvertent spilling of fecal material from the colostomy into the abdominal wound. The wound was closed with steel wire as described previously. On the fourth postoperative day because of infection throughout the entire length of the subcutaneous layer down to the anterior layer of the rectus sheath the wound had to be opened superficially and the steel wire sutures were exposed in the base of the wound. In spite of repeated contamination from the colo-

TABLE I.—EARLY AND LATE ABDOMINAL WOUND COMPLICATIONS IN MALIGNANT CONDITIONS

	Group A Catgut-silk closure	Group B Steel wire silk closure
No. patients	73	86
Total complications	21	5
Wound infections		
Minor	4	0
Major	2	0
Dehiscence		
Minor	1	0
Major	4	0
Eventrations	3	0
Incisional hernia		
Infected wound	2	0
Noninfected wound	2	0
Painful wound	0	0
Sinus tracts	3	1
Serum pocket	0	0

stomy the wound rapidly healed with the application of wet dressings and with daily irrigations. The granulation tissue quickly covered the steel wires without the development of sinus tracts or incisional hernia.

DISCUSSION

A through-and-through closure (stay suture) of some nonabsorbable suture material has been generally accepted as the best method for closure of disrupted wounds.^(1, 2, 7) The value of careful approximation of fascial layers has been stressed by Howes and Norris.⁸ The technique described here employing stainless steel wire has the combined advantages of a layer closure because of the small loops which appose the peritoneum and fascia, and of a stay suture because of the through and through loop with its deep bites of tissue. This method of closure eliminates the need for conventional stay sutures.

It has frequently been noted that the interstices in multifilament suture material act as niduses for the growth of bacteria in contaminated or questionably clean wounds and in the presence of infection may result in sinus tract formation. This possibility is eliminated when steel wire is used.

We believe that the greater success of steel wire abdominal wound closure as it has been described can be attributed to the following factors.

1. The greater tensile strength produces a stronger wound in the immediate postoperative period before wound repair has occurred.

2 Less trauma is necessary and tissue strangulation may more easily be avoided in placing sutures in such a manner than is possible with the usual types of layer closure.

3 This combined with the fact that there is less tissue reaction to the alloy steel, promotes increased resistance to infection and more rapid wound healing.

SUMMARY AND CONCLUSIONS

1 A comparison between 110 abdominal wounds closed with catgut-silk is made with a similar number closed with alloy steel wire.

2 The overall incidence of wound complications in the catgut-silk group was 37 (33.6 per cent) and in the steel wire group 8 (0.07 per cent).

3 Alloy steel wire was well tolerated by the tissues. It can be used in the presence of infection with little fear of sinus tract formation.

4 Dehiscences or eversions occurred in 10 wounds (9 per cent) in the catgut-silk group. No such accident occurred in the steel wire group.

5 Postoperative incisional hernias were

reduced from 12 (11 per cent) in the catgut silk group to none in the steel wire group.

6 We believe that the method described for using alloy steel wire produces less trauma, results in maximum tensile strength during the early postoperative period when it is most needed and combines the advantages of a layer closure with the advantages of a stay suture closure.

7 The use of alloy steel wire has provided an added safety factor in the surgical management of the poor risk patient.

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INTESTINAL LIPODYSTROPHY (WHIPPLE'S DISEASE)

Preliminary Report of Three Cases in an Early Stage of the Disease
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SINCE Whipple first described a case of "intestinal lipodystrophy" in 1907, 13 additional cases have been reported in the literature (1-3 5 6 9-14). Recently, 3 patients who we believe had the disease in an early stage came under our care. The condition of all was suspected on the basis of the gross observations made at operation, and the suspicion was confirmed by the results of biopsy. In addition to the fact that these 3 patients presumably had a rarely described disease, they are of interest because the condition was diagnosed relatively early and because an opportunity became available for study of the disease as it progresses.

REPORT OF CASES

CASE 1: A man 65 years old was admitted to the Mayo Clinic on December 26, 1945 with a history of change in bowel habits of 3 months duration and pain of 3 months duration in the lower part of the abdomen. Otherwise the medical history revealed several joints for a period of 1 week when the patient was 16 years old. Three months before admission of the patient he had begun to have two to four small, hard, lumpy stools daily, in contrast to one normal stool daily previous to that time. One month later an intermittent, cramplike type of pain in the lower part of the abdomen had developed. These symptoms had continued unremittingly. Four days before his admission the patient had experienced rather severe, persistent low backache. At no time had there been any symptoms referable to the upper part of the gastrointestinal tract. Results of a general systemic inquiry were negative except for the information that about 30 pounds (about 14 kgm.) had been lost during the preceding year.

Physical examination revealed only an indefinite nontender mass in the upper and middle parts of the abdomen. The essential laboratory observations are summarized in Table I. Results of roentgenologic examination of the stomach, small intestine and colon were negative.

Because of the presence of an abdominal mass and because loss of weight appeared to be progressive, From the Divisions of Surgery and of Medicine Mayo Clinic and the Division of Surgery Mayo Foundation.

the patient underwent operation on January 4, 1946. The tissues of the mesentery of the small intestine were found to be greatly swollen and thickened. They presented a dirty creamy color suggestive of that of dilated lacteal vessels. There were no firm tumors. On palpation the mass in the abdomen felt leathery. The tissues most involved were those at the attachment of the mesentery to the posterior abdominal wall. There was some extension of the process into the mesentery toward the small bowel. The wall of the small bowel was normal. The pancreas was normal to inspection and palpation. There was no evidence that any tumor was compressing the thoracic duct. Results of further exploration of the abdomen were negative. A specimen of tissue near the base of the mesentery and another specimen from a more distal portion of mesentery were taken for histopathologic study.

Sections of the tissues in question proved to contain intracellular and extracellular fat, numerous mononuclear foam cells marked necrosis of fat with a cellular infiltration consisting mainly of lymphocytes but also including occasional polymorphonuclear and eosinophilic cells. In several places fibrosis of varying degree was demonstrated. There was only an occasional foreign-body giant cell to be seen (Fig. 1 a).

The postoperative course of this patient was uneventful. As a result of the observations made at operation additional studies relating to digestion and absorption were carried out (Table I). A special diet in which 101.6 grams of fat and 117.5 grams of protein were to be ingested daily was prescribed. The average daily content of fats and nitrogen in the feces was within normal limits. The blood fats were studied. In general the values for blood fats were found to be low normal or subnormal. The values for blood calcium, phosphorus and serum protein were normal or approximately so. The basal metabolic rate and the values for gastric acids were reported as normal. The patient continued to have mild leucocytosis and to lose weight in spite of the fact that he was eating food that provided 2,400 calories daily. Results of the Extol and Rose glucose tolerance test and vitamin A tolerance tests were normal.

During the patient's postoperative course in the hospital a few small discrete lymph nodes were felt in each groin and in the left axilla. However, specimens for biopsy were not taken from any of these three locations. It was decided to watch for any further enlargement.

SURGERY GYNECOLOGY AND OBSTETRICS

TABLE I—INTESTINAL LIPODYSTROPHY COLLECTED LABORATORY DATA IN CASE 1

Value for or results of	Dec. 1945, day			Jan. 1946, day			
	10	20	3	1	8	26	26, 00
Leucocytes, per cu. mm. of blood	3,100	3,100	3,000	6,000			
Hemoglobin, gm. cc. of blood	15		7				
Sedimentation rate (Westergren), mm. per hr.	46	30	30				
Urea, mgm. 100 c. of blood							
CO ₂ combining power, vols. cc. of plasma							
Chlorides, mgm. 100 c. of plasma				34			3
Cholesterol, mgm. 100 c. of plasma			23	30			
Cholesterol esters, mgm. cc. of plasma			303	615			
Fatty acids, mgm. 100 cc. of plasma					07		
Lactids, mgm. 100 c. of plasma					28		7 137
Lipoids, total, mgm. 100 of plasma				50	24		64 24
Calcium, mgm. 100 c. of serum					8		100 244
Phosphorus, mgm. cc. of serum							55 100
Liver function (Bromsulphalein test)							300 30
Bum metabolic rate				No variation			9
Bilirubin, mgm. cc. of serum							3 8
Proteins, total, mgm. 100 serum							
A/G ratio							
Gastric acids (free), units (Topfer) (none)							+
Glucose tolerance test (Eliass and Rowe)							
Vitamin A tolerance test							7 7-2
Fats, stools (average daily values)							
Nitrogen, stools (average daily value)							
						Normal	
						Normal	
						Normal	
						Normal	

The patient received roentgenologic treatments on four successive days. They were administered over the abdomen. He was instructed to take one to two tablets of a choleretic agent (ketochol, a form of bile salts) after each meal. This treatment was based on the apparent success achieved with roentgen rays in Boeck's case and with bile salts therapy in Pearce's case.

CASE 2 A woman, 63 years old, was admitted to the clinic on February 8, 1946 complaining of an abdominal mass that had been found by her referring physician during a physical examination. The history revealed that the patient had had smallpox in 1911 and pyelitis in 1935 and 1943. A stone in the left ureter had been found in 1943. Surgical treatment carried out previously included appendectomy in 1916, hysterectomy and oophorectomy for cancer of the uterus in 1917 and cholecystectomy for gall stones in 1935. The patient had had hypertension subsequent to 1935; the blood pressure at systole usually was found to be around 200 millimeters of mercury.

In August, 1945 the patient had had an attack of distress in the upper part of the abdomen. The pain

had extended to the shoulder blades and was relieved by vomiting. In December 1945 she had had a similar attack and had applied heat locally for relief. She had burned her abdomen, and in the course of treatment her physician had felt an abdominal mass. A careful systemic inquiry revealed that she had had six episodes of diarrhea, each lasting a week, in the year prior to her admission to the clinic. At these times she had passed four to eight stools during the first 8 hours after breakfast. Sometimes nausea and vomiting, but not pain, had occurred. The diarrhetic stool had consisted mainly of undigested food, and occasionally of mucus and frothy material. The patient believed that her stools had become bulkier during the period of the year prior to the time when we saw her.

On physical examination the patient was found to have a systolic blood pressure of 110 and a diastolic pressure of 80 expressed in millimeters of mercury. The pulse rate and temperature were normal. Abdominal examination revealed an ill-defined non-umbilical mass which was situated at the level of the

The essential laboratory observations are included

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in Table II. Results of roentgenograms taken of the colon and of the thorax were negative. The sedimentation rate of the blood was 16 millimeters in 1 hour (Westergren method).

On February 14, 1946 the patient was operated on by Dr. D. O. Ferris. In the surgical report it was said "The mass was found to be in the mesentery of the small bowel. It arose from the root of the mesentery and at the site was 2 to 3 inches in thickness and looked like fat necrosis. Interestingly the lacteals of the small bowel were all dilated and were two to three times normal size, making definite white streaks across the small bowel. The other organs were reported as being normal. A specimen of tissue was taken for microscopic study (Fig. 1 b). The description of the specimen is exactly that given for the specimen concerned in the preceding case. In both cases the absence of many giant cells and much dilated itself was in a relatively early stage meaning lymph spaces and more fibrosis would have been observed."

The condition of this patient was also studied postoperatively from the standpoint of possible abnormalities in intestinal absorption and in fat metabolism. The observations are summarized in Table II. All the results of laboratory studies were within normal limits. The patient was dismissed after being instructed in the taking of bile salts.

CASE 3. A woman, 58 years old was first admitted to the clinic on December 31, 1928. At that time she was found to have a duodenal ulcer, had severe and mild arthritis of the left shoulder. She was again seen at the clinic on December 11, 1945. She had followed a medical regimen for the ulcer for about 15 years with satisfactory results. Regression of the symptoms of arthritis had occurred and persisted for several years, but pain and aching had been present during the 3 years prior to her last admission. At the time of this admission she complained mainly of a constant ache in the upper part of the abdomen with frequent nausea, flatulence, occasional light colored stools and intolerance to fatty foods. She had not been present, however, the patient had had loose stools described as mucus stools. There had not been any loss of weight.

Physical examination revealed a palpable tumor mass in the epigastrium and left side of the upper part of the abdomen. It was firm, irregular, not very tender and partially fixed. The essential laboratory observations are found in Table III. Results of roentgenologic examinations of the gall bladder, stomach, colon and terminal portion of the ileum were negative, except for the duodenal ulcer.

The patient was operated on by Dr. S. W. Harrington on December 19, 1945. His report was as follows: Upon exploration of the tumor mass in the left upper abdomen it was found to be a diffuse area of thickening at the extreme root of the mesentery immediately over the aorta, beginning in the mesen-

TABLE II — INTESTINAL LIPODYSTROPHY COLLECTED LABORATORY DATA IN CASE 2

Values for or results of	Feb. 1946, day		Mar. 1946, day	
Leucocytes, per cu. mm. of blood	8,900		5	13
Hemoglobin, grm., 100 c.c. of blood	4.4	5		
Sedimentation rate (Westergren), mm. per hr.	6			
Urea, mgm., 100 c.c. of blood	36			
Cholesterol, mgm., 100 c.c. of plasma		34		
Cholesterol esters, mgm., 100 c.c. of plasma		68		
Fatty acids, mgm., 100 c.c. of plasma		304		
Lecithin, mgm., 100 c.c. of plasma		45		
Lipids, total, mgm., 100 c.c. of plasma		528		
Calcium, mgm., 100 c.c. serum				
Phosphorus, mgm., 100 c.c. serum			0.5	
Protein, mgm., 100 c.c. serum			3.4	
A/G ratio		5.8 3.7		
Gastric acids (free) walls (Total)				32 48
Glucose tolerance test (Eaton and Rose)				Normal
Vitamins A tolerance test				Normal
Fats, stools (average daily values)				Normal
Nitrogen, stools (average daily values)				Normal

tery of the jejunum at the ligament of Treitz and extending down almost to the pelvis involving most of the root of the mesentery of the small bowel. The area had a light yellow, milky color. The area was about 2 to 3 centimeters in thickness at the largest part. It did not come up to the small bowel. There was an area of normal appearing mesentery at least 2 1/2 to 3 inches from the mesenteric margin of the jejunum.

A perforating duodenal ulcer with moderate obstruction was fixed to the pancreas. The other organs were found to be normal. Partial gastrectomy of the posterior Pólya type was done. A specimen of tissue from the tumor mass was taken for microscopic study (Fig. 1 c). The microscopic appearance was that of inflammatory fat. There were both intracellular fat and extracellular fat. There were both clear foam cells and necrosis. There was infiltration of lymphocytes with occasional polymorphonuclear and eosinophilic cell also fibrosis in several areas. The postoperative course was uneventful. The patient was dismissed from the hospital on the

TABLE III.—INTESTINAL LIPODYSTROPHY COLLECTED LABORATORY DATA IN CASE 3

Values for or results of	Dec. 1945		June 1946	
	Day	26	2	30
Leucocytes, per cu. mm. of blood	5,600		10,100	
Hemoglobin, gm., 100 c.c. of blood	1		9	
Sedimentation rate (Westergren), mm. per hr.			00	
Bilirubin, mgm. 100 c.c. of blood		26		
Chlorides, mgm. 100 c.c. of plasma		600		
CO ₂ combining power vol., 100 c.c. of plasma		24		
Cholesterol, mgm. 100 c.c. of plasma				234
Cholesterol ester, mgm., 100 c.c. of plasma				24
Phospholipids, mgm., 100 c.c. of plasma				264
Fatty acids, mgm. 100 c.c. of plasma				269
Lipids, total mgm., 100 c.c. of plasma				602
Protein, total, mgm. 100 c.c. of serum				66
A/G ratio				1.3
Gastric acids (free), units (Taylor) (total)	44	26	6	
Vitamins A (cholesterol test)				Normal
Fats, stools (average daily value)				Normal
Nitrogen, stools (average daily value)				Normal

twenty-second postoperative day and from the clinic on the twenty-fourth postoperative day. She returned to the clinic on June 19, 1946 for a postoperative examination at the end of 6 months. Constant aching over the abdomen had persisted, but there had been no loss of weight. At the time of this last examination she underwent studies of abnormalities in intestinal absorption and digestion of fat. These observations are summarized in Table III. Results of all the laboratory studies were within normal limits. The patient received a course of roentgen therapy over the abdomen on four successive days. She was not given bile salts.

In all 3 cases the studies of pathologic tissue were done by Dr. John R. McDonald.

In the cases of intestinal lipodystrophy reported in the literature the anatomic data are similar enough to indicate that the condition is a definite disease entity. A brief review will be presented of the essential symptoms, physical observations, laboratory data, and ana-

tomic characteristics in the cases thus far reported.

Clinical picture. In the 14 reported cases, 13 patients were men. The mean age was 49 years the majority of patients were in the fifth and sixth decades. Early in the course of the disease postprandial discomfort, indigestion and gaseous distention are noted. Later diarrhea, severe loss of weight, progressive asthenia and general debility are present. In 4 cases the diarrhea was associated with gross blood in the stools. In 2 cases constipation was reported. The diarrhea was often associated with steatorrhea. The symptoms varied in duration from 6 months to 15 years. 9 of the patients had had distress for more than 2 years. In 6 cases there was a history of arthritis.

The physical observations are those associated with general debility. The abdomen often is described as feeling like dough at palpation and the lymph nodes are sometimes palpated as abdominal masses. Four patients had slight icterus, two had purpura and about half had a moderate degree of dependent edema. Inguinal and axillary lymph nodes were palpably enlarged in 2 cases. In the few cases in which the disease has been so studied, results of roentgenologic examination of the gastrointestinal tract were normal.

All patients in these reported cases had moderate anemia, but only 2 had leucocytosis. Six had achlorhydria. Results of urinalysis were normal as were results of studies of blood chemistry. Studies of stools did not disclose ova, parasites, or significant organisms. In 2 cases chemical analysis of the stool was made. In Whipple a case 80 per cent of the dried stool was fat, of this fat, 50 per cent was neutral fat and 30 per cent was fatty acids. In Pearce a case, about 60 per cent of the dried stool was fat, 44 per cent of this was fatty acids, 12 per cent was neutral fat and 3 per cent was unsaponifiable substance. After treatment with bile salts orally the percentage of fat in the stools of Pearce a patient decreased to 25 only fatty acids being present.

Pathologic aspects. The essential pathologic observations are present in the mesenteric portion of the small bowel and its mesentery.



Fig. 1 a, Tissue from the mesentery of the small bowel in Case 1 showing numerous mononuclear foam cells, intracellular and extracellular fat, moderate infiltration of lymphocytes and minimal fibrosis (hematoxylin and eosin, X135) b, tissue from similar situation in Case 2 with ap-

proximately the same changes (hematoxylin and eosin X135) c, tissue from Case 3 with changes similar to those in the other two (hematoxylin and eosin X135)

Grossly the mesentery is thickened yellow and has a rubber consistency. The lymph nodes in the mesentery, and especially those near the root are enlarged firm and on cut section often present a spongy appearance because of dilatation of the lymph sinuses. The lacteal vessels may be dilated enough to be seen grossly. The mucosa of the jejunum and ileum is either normal in appearance or is swollen and flecked with minute deposits of yellowish white lipid. In 3 reported cases there was chylous ascites in 7 cases fibrous pericarditis was present. Microscopic examination of the mesentery reveals marked dilatation of the lymph vessels and the presence of large mononuclear foam cells extracellular as well as intracellular fat deposits, foreign body giant cells lymphocytic infiltration and fibrosis. The mesenteric lymph nodes present a similar picture. In 11 of the 14 cases the small intestine presented similar changes in the stroma of the mucosa and submucosa.

Our first patient presented only loss of weight rapid emaciation and cramps in the lower part of the abdomen. The diagnosis was suspected on the basis of the characteristic appearance of the mesentery of the small bowel at operation and was confirmed by microscopic examination of specimens taken for biopsy. Although this patient did not have steatorrhea and the fat content of the stool and absorption of vitamin A were normal the values for blood fats were low normal or subnormal at all times. Laboratory data con-

cerning the second and third patients were entirely normal. Interestingly enough all 3 patients were operated on because of the finding on physical examination of an indeterminate mass and relatively minor systemic or local symptoms. None had the steatorrhea or the well developed picture described by most of the other authors. All 3 patients did have some tendency toward an increase in the number of stools during the year preceding their visits to the clinic. It is our feeling that the absence of positive results of laboratory studies in these cases is referable to the fact that the disease of the patients was at the time we saw them in a relatively early stage.

Pathogenesis. Although the gross and microscopic pathological observations have been adequately described and although the essential finding is that of intracellular and extracellular fat associated with the features of a chronic inflammatory reaction the nature of the lipoid and the manner in which it arrives in the interstitial tissues of the involved organs are unknown. Several theories have been advanced to explain these features. Sailer and McGann said. The essence of the pathological process appears to be a local necrosis of the fat tissue with liberation of lipolytic ferments from the damaged cells. These authors however did not attempt to explain either how this necrosis is brought about or the nature of the ferments. Jarcho believed that dilatation of the lymphatics either obstructive or congenital is the essential characteristic. Hill agreed with this

is our impression that in all 3 cases the disease is in a relatively early stage it is hoped that further study of the patients concerned will throw some light on the true nature of the disease.

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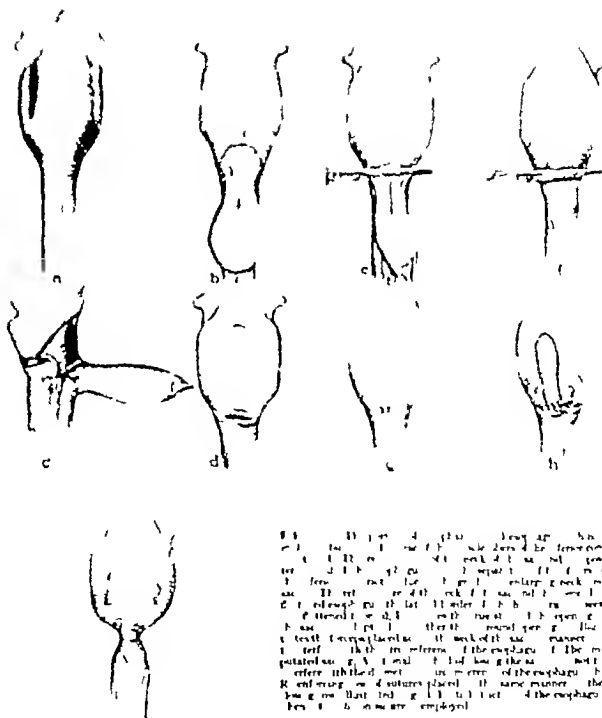


Fig. 1. The surgical approach for the treatment of hiatal hernia. a) The abdominal wall is incised vertically. b) The abdominal wall is incised transversely. c) The abdominal wall is incised transversely with a horizontal extension. d) The abdominal wall is incised transversely with a central vertical extension. e) The abdominal wall is incised transversely with a central vertical extension and a small incision on the right. f) The abdominal wall is incised transversely with a central vertical extension and a small incision on the right. g) The abdominal wall is incised transversely with a central vertical extension and a small incision on the right.

geal wall at this point of pressure. The cricoid cartilage does not rest against the same vertebra or vertebral joint in all individuals. Its position depends on the stature of the person and the length of neck. It may rest against the lower border of the fourth cervical vertebra, but usually rests about opposite the fifth joint although it may be lower. There is some reason to believe that in individuals with more than average anterior curvature of the cervical spine, the cricoid cartilage rests more firmly against the spine.

Further reasons are that the upper portion of the posterior surface of the cricoid cartilage does not rest against the spine as does the lower portion, and it is here that herniation occurs. Just below the lower border of the cricoid cartilage the transverse fibers of the constrictor pass beneath the cartilage creating a shelf like fold. Chevalier Jackson has designated this portion of the muscle described as a pinchcock muscle, which closes the opening of the esophagus except during swallowing and regurgitation and believes that the muscle does not always co-ordinate its functions with the fibers of the inferior constrictors which are above the transverse fibers and have the general description of an inverted V.

Diverticula occur three times as frequently in men as in women. The male larynx is, on the average, one and one-half times the antero-posterior diameter of the female. Men are more muscular and the larynx is consequently held more firmly in contact with the spine. I recently saw a man who sustained a compression fracture of the fifth cervical vertebra with slight anterior displacement of the body of the vertebra, the pressure of which caused a bilateral recurrent nerve paralysis and within a few days necessitated a tracheotomy. I have seen decubitus ulcers develop in the esophagus or hypopharynx, on the posterior surface of the cricoid cartilage, from the pressure of a nasal feeding tube. In one instance, a bilateral cord paralysis resulted, in the other a unilateral paralysis. Other cases are reported resulting in mediastinitis. Surgical literature abounds with reports of such complications. The development of such ulcers serves to prove the firmness with which the cricoid cartilage is held in contact with the spine. I

do not know that it is a matter of importance as to whether or not one wishes to think of the constrictor mechanism at the junction of the pharynx and esophagus as comprising one or two muscles. It is mentioned only because the foregoing explanation of the etiology of the pharyngoesophageal diverticula seems more logical than that of a congenital hiatus in the mechanism. For proof of the firmness with which the larynx is held against the spine, simply grasp your own larynx between your thumb and index finger. It is easily displaced laterally. Now try to press it backward, and you will see that it is held firmly against the spine.

While making fluoroscopic examinations of patients with diverticula of the esophagus it was observed that the first swallow of barium mixture entered the diverticulum and only when it was filled did any pass into the esophagus, and that the fluid level at the opening of the sac approximated the width of the esophagus.

The spill-over of barium mixture from the opening in the sac, when observed under the fluoroscope, is an accurate measure of the width of the diverticulum opening. If an x ray photograph be made at the moment when the diverticulum is completely filled the fluid level will represent an accurate determination of the width of the opening. These observations caused me to alter my plan of dealing with the neck of the amputated diverticulum. In intestinal surgery sound principles dictate that the surgical closures of the bowel be done in a manner so as to create the least disturbance of the lumen of the bowel. The same principle applies to esophageal surgery.

Jackson and Jackson in the book entitled *Diseases of the Nose Throat and Ear* page 594, published in 1945 state "The esophagoscope will without difficulty enter the sac which is really the whole bottom of the pharynx, and will be arrested by the blind end of the pouch, the depth of which may be from 4 to 10 cm. The opening at the mouth of the sac, so dominates the hypopharynx that the passage of rigid instruments either for the purpose of examination or as part of operative technique, is a dangerous procedure except in the hands of those highly skilled in the use of

such instruments I have seen one patient who died as a result of mediastinal infection caused by perforation of the sac by passage of an esophagoscope through the pouch of the diverticulum. Some surgeons have recommended insertion of an illuminated instrument into the sac as a means of identification during its removal. Because of such accidents I would hesitate to employ that method.

In a majority of instances, diverticula are said to shift toward the left side of the midline of the neck. It is my opinion that this tendency is due to the fact that the distended sac bulges in the direction of least resistance which is to the left side. The left common carotid artery is farther removed from the trachea and esophagus than the right. The innominate artery and the left common carotid both arise from the arch of the aorta, on the left side of the midline. The innominate artery crosses in front of the trachea and divides into the right common carotid and subclavian. A line from the point of origin of this vessel to the foramen lacerum crosses the trachea and lies closer to its right border, than a similar line following the course of the left common carotid, which runs an almost perpendicular course from its point of origin to the corresponding foramen on the left side. The only diverticulum which I have encountered, causing a visible bulge, in the neck protruded to the right. For a right handed surgeon the regions and structures lying behind the larynx, pharynx and esophagus are easier to approach from the left side.

The preoperative preparation of the patient is important. Only liquid and soft foods should be given for at least 24 hours before operation. The evening before operation the patient should be instructed to lavage the sac on two or three occasions by swallowing water then lie down and empty the sac by strong swallowing efforts. One hour later 1 or 2 drams of a 10 to 20 per cent solution of tincture of metaphen, or tincture of merthiolate is administered with instructions to swallow it with one effort and to refrain from any effort to empty the sac. This is done for the purpose of reducing the bacterial content of the sac. How effective this is I do not know. In any event it does no harm. In our experience no infections or fistulas have occurred following

the one stage operation. A high percentage of the wounds following the two stage operation have had some degree of infection. This is believed to be due to the presence of gauze packing placed in the wound and left in place for a period of a week or more.

TECHNIQUES

Either local or general anesthesia may be used in the operation. My preference is sodium pentothal. The combination of nitrous oxide and ether is also satisfactory. Inflammable gases are undesirable because the cautery or coagulation current is a valuable agent in sealing the severed end of the sac. Local block anesthesia is satisfactory. It has one advantage in that the conscious patient's co-operation can be secured during the exposure of the neck of the sac, and determination of where the neck of the sac begins and the wall of the esophagus ends, is more easily made. The act of swallowing helps in determining the junction point. A suction device should be present for the purpose of removing from the pharynx, any contents of the sac which may be extruded into the pharynx, during manipulation of the sac.

As a rule the left side is the location of choice for making the incision. However, if by fluoroscopy or other examination the sac seems to lie more to the right, a right side incision becomes the location of choice. An incision 2 1/2 to 3 inches long, is made just anterior to the border of the sternomastoid muscle. Some surgeons prefer a transverse incision which results in a better scar. The incision extends through the skin platysma muscle, and deep cervical fascia. The omohyoid muscle is ligated, divided and separated from the sternothyroid muscle. The muscle is retracted outward the exposed outer border of the thyroid gland is retracted forward. The middle thyroid vein and inferior thyroid artery are ligated and divided if in the way. I have not always found this necessary. The carotid sheath is separated from the esophagus by passing the finger upward and downward along the space between it and the common carotid artery. The dissection should be carried high enough to expose the lateral border of the larynx and those fibers of the

inferior constrictor which surround the hypopharynx. This exposes the lateral borders of the esophagus and sac, except in cases of small diverticula. In the event the sac is not readily identified the loose space behind the esophagus and larynx should be opened or separated and the finger passed upward until the lower border of the cricoid cartilage is felt. The neck of the sac will always be found in the region of this constant point of identification.

A diverticulum begins as a small budlike bulge in the posterior wall of the hypopharynx or the upper margin of the esophagus. As it enlarges, the fibers of the inferior constrictor become further separated by the enlarging neck of the sac. Some of the thinned fibers fan out over the neck on its upper and lateral surfaces. A very sharp angle is created on the lower or undersurface of the neck of the sac where it leaves the esophagus. At this point some of the transverse fibers become rolled into a sort of bundle or cord over which the neck of the sac is suspended. This bundle of fibers should be divided and laterally separated and later may be used to cover the line of sutures closing the amputated neck of the sac. They should not be left to create another shelf like fold in the posterior wall of the esophagus. All other muscle fibers should be removed from the neck of the sac so as to provide a good view of its entire circumference.

It is important to determine carefully where the neck of the sac begins and the wall of the hypopharynx or esophagus ends. Caution should be exercised in removing muscle fibers from the neck of the sac, as it is quite thin and easily perforated. When the junction point has been determined it will be observed that the neck of the sac is practically the same size width or diameter as the esophagus.

The method of closing the neck of the sac is of greatest importance. If as has been recommended by some surgeons a transfixion and ligation suture be used, then practically one half the circumference of the esophagus may have been destroyed and an immediate narrowing or partial stricture created. If the transfixion and ligation suture is too far removed from the esophageal wall, a dimple will result, which is an invitation for recurrence of the diverticulum.

During the last 3 years I have devised and used a method of removing the sac and closing its neck that has proved entirely satisfactory. This procedure is based on sound anatomic and surgical principles a description follows.

In the resting state the opening of the sac is not a small round hole in the posterior wall of the esophagus but an elliptical slit occupying the entire diameter of the esophagus (see Fig 1 d). When the neck of the sac has been entirely freed and traction has been made upon its fundus the elliptical opening becomes rounded because of traction. The fundus is then grasped with an ordinary pair of triangular bladed forceps the sac is freed and the surrounding muscle fibers divided as previously described. It should be remembered that at the point of junction the esophagus and diverticulum make up a double barrelled tubular arrangement comprising two flattened tubes each about 1 inch in diameter one of which is immediately in front of the other. When the sac is freed and traction is put upon it instead of the barrels occupying a parallel position the sac then occupies a right angle position. A narrow bladed forceps of the Rankin or similar type is placed across the neck of the sac at the point of junction. This forceps does not interfere with or include any of the circumferential wall of the esophagus, and no narrowing or stricture is produced. It leaves the diameter and circumference undisturbed. A second forceps is placed parallel to the first and the neck of the sac is amputated between the two. The cut edge of the sac is sealed by electrocoagulation and painted with tincture of metaphen. A No. 00 chromic cat gut suture on an atraumatic needle is passed through both walls of the remaining amputated stump immediately behind, and next to the lock of the forceps. It is tied and continued for a couple of loose turns. This forceps is then removed. The suture is tightened and continued as a running suture (Fig 1 g) where it is again tied at the other side of the amputated neck of the sac. The suture should not be pulled taut enough to cause puckering of the closure. A second row of a similar running stitch is then placed infolding the first (Fig 1 h). A few interrupted sutures, picking up the divided muscle fibers may be used to

further reinforce the closure this, however, is not important. A little confusion may be encountered in placing the forcep at a right angle across the neck of the sac. This results because the upper end of the esophagus and the hypopharynx are anchored respectively to the posterior surface of the cricoid cartilage and the lateral borders of the thyroid cartilage. The esophagus therefore, cannot be rotated as a flattened tube when tension is made on the sac. One must make allowance for the altered relationship of the sac and the esophagus at this stage of the operation. It may be found convenient to place the forceps somewhat diagonally upward and downward, across the neck of the sac.

At this time a small feeding tube may be introduced through one nostril, and guided down the esophagus. We have not regularly used a feeding tube and are not convinced that it is necessary or even desirable. When used, 4 days has been the maximum time it has been left in place. When the closure is complete the wound is lavaged and a few sulfathiazole crystals are dusted (not dumped) into the wound. Penicillin may be substituted. A small Penrose drain is inserted and left in place for 48 hours. The omohyoid muscle is sutured and the wound is closed with interrupted catgut and skin clips.

Nothing by mouth is given for 2 days. If a feeding tube is used, liquids are administered through it for 3 or 4 days. If not used intravenous fluids are given for 48 hours. Fluids by mouth are begun in 48 hours.

During the last 3 years this operative procedure has been employed on 11 patients with

no infections, no fistulas or other complication. Postoperative dilations have not been necessary. The patients were hospitalized for 3½ to 7 days.

Prior to that time when the two stage operation was employed three fistulas and a high percentage of infected wounds resulted. One death occurred several years ago in a very much emaciated arteriosclerotic woman aged 75 years the result of a coronary occlusion 24 hours after the first stage of an uncomplicated operation. This cannot be attributed to the two stage method.

In my experience, the removal of pharyngo-esophageal diverticula has not been a difficult operation except in the case of one small diverticulum which when empty was so contracted that it lay immediately behind the larynx and was difficult to find. I suggest that if one has difficulty in locating the sac, the space behind the upper end of the esophagus be opened. This is easily done because of the loose connective tissue occupying that region. Then pass the finger upward behind the esophagus and larynx until the lower border of the cricoid cartilage is felt. The neck of the sac will always be found in the immediate vicinity of the lower border of the cricoid cartilage. In large diverticula, the sac is usually easily identified and the above procedure will be unnecessary.

If one is familiar with the anatomy of this region and understands the mechanics of the pharynx and esophagus and the development of an esophageal diverticulum, there should be no difficulty in effecting a cure by a one stage operation.

TUMORS OF THE GASTROINTESTINAL TRACT

A Survey of 813 in Persons of Military Age during World War II

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THE gastrointestinal tract proved to be a favorable site for the development of tumors in persons of the Army age group. As a result, specimens from the digestive tract made up one of the largest sections of the entire collection for the period of World War II at the Army Institute of Pathology. It seemed appropriate, therefore, to make a thorough survey of these tumors emphasizing their relative frequency, anatomic distribution, histologic characteristics, and pertinent clinical features. By this study many well known facts have been given emphasis and a number of little known facts have been brought to light and to some extent clarified.

Eight hundred and thirteen tumors of the gastrointestinal tract arising in Army personnel between the ages of 18 and 38 were examined at the Institute between December 7, 1941 and August 15, 1945. Anatomically the lesions were situated between the pharyngo-esophageal junction and the anus, those arising in the buccal cavity and pharynx form the basis of a separate report. Almost all of these tumors constituted a primary, new disease in a previously healthy individual; a few were discovered at autopsy in patients dying from other causes. The diagnoses under which the specimens were classified can be accepted with a considerable degree of finality in view of the fact that most of the lesions were not of controversial character.

MATERIAL

The statistical studies incorporated herein are based entirely on the records at the Army Institute of Pathology. No attempt was made to conduct an independent analysis of the gross anatomic material or the histologic sections. In the vast majority of cases a reasonable unanimity of opinion was reached by the

From The Army Institute of Pathology, Washington, D. C.

pathologists who reviewed the material. In some instances unresolved differences of opinion were evident in the records and in such cases it was necessary for the authors to decide in the light of available information in which category to place the lesion for statistical purposes.

The 813 lesions selected for analysis occurred almost entirely in enlisted or officer personnel of the Army of the United States. Occasional specimens were obtained from prisoners of war and internees of relocation centers. Seven hundred and forty nine were found in white, 58 in negro and 6 in mongolian patients. This distribution is consistent with the ratio in overall Army population. Forty two of the patients were women.

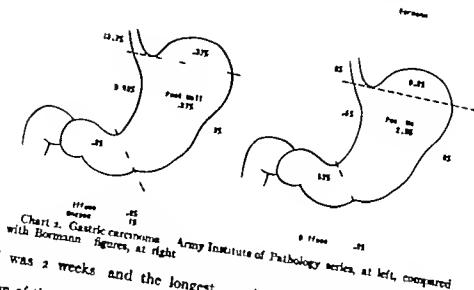
The lesions were classified from a cytogenic standpoint and the results are summarized in Table I. A few specimens not strictly regarded as neoplasms were included for their general clinical and morphologic interest. In Table V all the varieties of tumor found in the gastrointestinal tract are listed according to their anatomic location.

CARCINOMA

There were 441 carcinomas in the group; they are subdivided by location in the gastrointestinal tract and by age of the patient in Table II and the percentage of fatality is listed. It is evident in this table that approximately half of the cancers of the large intestine occurred in the rectum (171/169). Carcinomas of the large intestine (including rectum) made up 77 per cent of the malignant epithelial tumors.

There were 26 cancers in the 18 to 30 year age group, 198 in the 31 to 35 year group and 217 in the 36 to 38 year group. In Chart 1 the same figures are expressed per 100,000 mean strength of the Army from December 7, 1941 to August 15, 1945. According to these

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est recorded was 2 weeks and the longest 26 months.

The location of the primary tumors is summarized in Chart 2. A comparison with published statistics shows a rough similarity in distribution.

In 45 cases the histologic variety was specified the findings are presented in Table III.

A review of the clinical data incorporated in the records brought out no unusual details. Positive roentgenologic interpretations were made in 31 cases. 5 of the tumors perforated spontaneously. ascites was recorded in 31.

Small intestine. There were 9 cases in which the diagnosis was primary carcinoma of the small intestine. 8 of them were adenocarcinoma and 1 was a mucous cell carcinoma. Two arose in the duodenum, 4 in the jejunum, and 3 in the ileum. There were 7 white males, 1 white female and 1 mongolian male in the group. Four of these patients are known to have died. the duration from onset of symptoms to death being 2, 5, 6 and 13 months. In one of these cases the diagnosis was confirmed on the basis of malignant cells in the sediment from ascitic fluid.

TABLE III.—HISTOLOGIC TYPES OF GASTRIC CARCINOMAS

Adenomatous	39	Colloid.
Scirrhus	3	Polypoid
Medullary	3	Anaplastic
Ulcer		

Appendix. Seven carcinomas of the appendix were reviewed. 1 from a patient under 21, 1 from patients in the third decade and 3 in the fourth. Two of these patients died the known duration of the disease being 5 and 13 months. The clinical diagnosis of acute appendicitis was made in almost every case and the true nature of the disease discovered only at operation or post mortem. Histologically, 5 were mucinous in 1 of the latter pseudomyxomatous peritoneal implants were encountered.

Large intestine. From the large intestine (not including the rectum and rectosigmoid) 171 carcinomas were removed. Ten of these occurred in patients under 21, 72 in patients in the third decade, and 89 in patients between 31 and 38. The total of 171 cases constitutes almost 40 per cent of all tumors of the gastrointestinal tract. The general distribution of these tumors is shown in Chart 3 and the relative percentage in each anatomic location follows rather closely those in published surveys (e.g. Oberndorfer etc.) The histologic types encountered are indicated in Table IV.

TABLE IV.—HISTOLOGIC TYPES OF CARCINOMA OF THE LARGE INTESTINE

3	Adenomatous	99	Papillary adenomatous	5
3	Mucous	33	Scirrhus	6
1	Medullary	3	Adenocarcinoma	
			Undifferentiated	

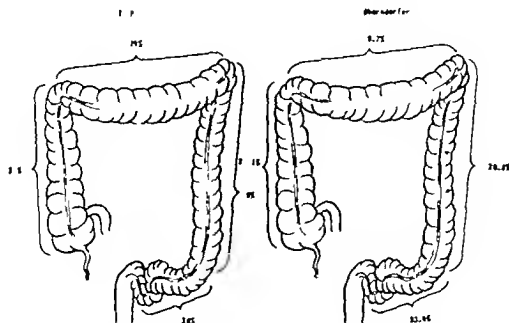


Chart 3. Carcinomas of the large intestine in Army Institute of Pathology series, at left compared with Oberndorfer's figures, at right.

There were 12 females in this series all other patients were white males except 17 negro males and 2 mongolians. These figures are approximately the racial ratio in the population

At the time figures were compiled for the survey there were 67 known fatalities. Death had occurred at an average interval of 8 months from the onset of the disease the longest duration recorded was 48 months

TABLE V—DISTRIBUTION OF ALL TUMORS

	Esophagus	Stomach	Small Intestine No.	Appendix	Large Intestine No.	Rectum	Anus	
Carcinoma	8	75	0	7	7	60		44
Carcinoid				65				76
Adenomatous polyp		3	7			05	14	42
Polyps			3		3			6
Polyp with typhloc								
Lymphoid polyp						53		53
Lymphoma 5		4	7		4			7
Leukemia								
Leukomyoma		0						
Leukomyosarcoma								3
Melanoma *2			4					5
Neuroma				5				5
Fibroma								
Hemangioma								
Hamartoma		5	14					9
Undifferentiated sarcoma								
Cyst	4		5					0
Endometriosis								3
	6		24	2	80	117	6	806

*Multiple sites in G-I tract.

pochochondrial distress. Magnesium sulfate in the duodenum relieved the distress and produced a copious bile flow.

Only manometric studies can make a diagnosis of motor dysfunction of the sphincter of Oddi at present. In the presence of a gall bladder delayed evacuation during a cholecystogram has been considered of diagnostic aid but evidence is contradictory and meager. The stimulus of a fatty meal is too variable for standardization of the procedure. Visualization of the hepatic ducts with a normal gall bladder *in situ* may occur with or without pain, generally the latter and is, therefore, neither helpful nor easy to explain.

The author suggests studying such patients with secretin-cholecystokinin as outlined in conjunction with cholecystography and attempts to visualize the hepatic ducts during cholecystography by feeding three egg yolks in milk. The latter could also be introduced into the duodenum directly and the patient given morphine hypodermically to contract the sphincter of Oddi in order to observe whether pain occurs during gall bladder contraction.

Postcholecystectomy colic in the absence of organic causes, or gross liver or bile duct disease must be considered as being due to sphincter spasm. In some cases if the colic is induced by 1/4 gr. of morphine the diagnosis may be strongly suspected. A more radioactive dye than now exists and which would be excreted by the liver in sufficient quantities to visualize the ducts without concentration should help in the diagnosis.

FREDERICK C. HORTON, M.D.

Varco, R. L.: Intermittent External Biliary Drainage for Relief of Pruritus in Certain Chronic Disorders of the Liver. *Surgery* 1947 2: 143.

Pruritus caused by certain chronic disorders of either the hepatic parenchyma or the intrahepatic biliary system (chronic hepatitis or cirrhosis) causes unremitting annoyance and is intractable to the therapy now customarily employed (dihydroergotamine (intramuscular), procaine hydrochloride (intravenous), sedatives, hypnotics and analgesics).

Varco reasoned that if it is true that the intractable pruritus is caused by the abnormal retention of bile salts then the development of a method for the reduction of the serum bile salt should constitute a rational therapeutic approach to this problem. As a result of the previous studies by Whipple and his collaborators, it was believed that because 90 per cent of the total quantity of bile salts secreted each 24 hours is resorbed from the intestinal tract, recirculated through the liver and then re-eliminated in the bile, only pre-enteric deviation of the bile would reduce the serum bile salt level.

Upon translating these conjectures into surgical procedures it was determined that intermittent external biliary drainage suffices to attain and maintain prompt and virtually complete relief from the pruritus of pruritus under consideration. The most active operative procedure for this purpose is cystostomy and drainage of the common bile duct with a T-tube size 1 to 2 French.

Small quantities of bile salts were given orally upon 3 occasions to patients who had an external biliary fistula. Pruritus promptly returned and then disappeared with the maintenance of intermittent external biliary drainage. ROBERT TURNER, M.D.

Mallet-Guy P., and Jeanjean R.: Surgical Eventualities in So-Called "Medical" Jaundice (Eventualités chirurgicales dans les ictères dit médicaux). *Lyon chir.*, 1946, 41: 189.

The author discusses the possible surgical complications of infectious jaundice, particularly dyspeptic disturbances persisting after subsidence of infectious jaundice, relapsing episodes of jaundice, and abnormal prolongation of jaundice.

If surgical exploration for one of these conditions fails to reveal a lesion in the biliary tract or the head of the pancreas, the symptoms are probably due to (1) hypertony of the sphincter of Oddi, (2) hypotony of the sphincter of Oddi, or (3) a variable degree of compression of the common bile duct usually associated with a chronic pancreatitis.

These may be differentiated from one another by manometric and roentgenographic studies of the biliary duct system made by cannulating the biliary tree at the time of operation. Usually the surgeon will find a precise disturbance of biliary function, either a relative degree of obstruction due to pancreatitis or a hypertonic or hypotonic sphincter of Oddi.

For obstruction due to pancreatitis, cholecystectomy is indicated. Biliary anastomosis is not indicated unless the obstruction is great enough to indicate some other condition than infectious jaundice. Similarly for cases of hypertonicity of the sphincter cholecystectomy appears to interrupt the evolution of sphincter spasm. However when the hypertonicity is too severe to be relieved by simple drainage transduodenal sphincterotomy is preferable and restores a more normal tonicity of the sphincter. If, on the other hand a state of atony of the biliary tract and sphincter exists, simple drainage of the gall bladder is the preferred treatment. In some of these cases splanchicectomy also is of value.

EDWARD W. GIBBS, M.D.

Clavel, G., and Dumas, J.: Acute Calculous Cholecystitis in Children (La cholecystite calculuse aiguë chez l'enfant). *Lyon chir.* 1946, 41: 412.

Acute calculous cholecystitis is rare in infants and children. The authors collected 103 cases and found that the greatest incidence of lithiasis in children occurred prior to the age of 1 year and just before the age of 15 years. Calculous cholecystitis is rare before the fifth year of age. Before the age of 10 acute cholecystitis occurs more frequently in males, but after the age of 10 the incidence is greatest in females.

The classical list of predisposing causes of calculous cholecystitis in children includes typhoid fever, scarletina, grippé, pneumonia, upper respiratory infections, gastrointestinal illness, intestinal parasites, appendicitis, and heredity. However in many cases

neither the antecedent history nor the operative findings suggested any definite predisposing cause.

There is nothing characteristic about the pathological findings in infants. Calculi of varying size number, and chemical composition are described. Examination of the gall bladder wall and lumen discloses the characteristic findings of acute cholecystitis, of catarrhal, suppurative or gangrenous type.

There is no doubt of the congenital origin of calculi for they have been described in the newborn and even in the fetus. In infants and children the pathogenesis appears to be the same as in adults except for the sudden increase in frequency of the disease in girls just before puberty which suggests an endocrine or vagosympathetic disturbance.

In a clinical study of 22 cases the authors found 8 cases of suppurative cholecystitis, 1 case of gangrenous cholecystitis, 10 cases of catarrhal cholecystitis, and 3 cases of cholecystitis with the complication of perforation or fistula formation.

Appendicitis is the most common diagnostic error. However in infants there are a certain number of gall bladder syndromes without lithiasis namely typhoid cholecystitis, scarlatina cholecystitis, external compression of the biliary tract by adenopathy, intestinal worms and acute noncalculous cholecystitis. Also, lithiasis is seen without cholecystitis and in some cases of hemolytic icterus.

The diagnosis is based on symptoms of pain, constipation, high fever and leucocytosis with a predominance of polymorphonuclear cells added to the picture of noncomplicated lithiasis producing painful crises and hepatic colic. If this picture can be distinguished from other acute peritoneal syndromes by its localization and clinical history an accurate diagnosis can be made.

Congenital lithiasis often associated with malformations of the biliary passages, is frequently fatal. Acquired cholelithiasis, if recognized and treated surgically bears a good prognosis.

The authors recommend early operation. Although cholecystostomy might at first seem to be particularly indicated in infants and children the frequently encountered advanced changes in the gall bladder wall will often necessitate removal of the gall bladder.

EDWARD W. GRANT, M.D.

Muir J. B. G.: Surgical Hazards in the Treatment of Cholecystitis and Cholelithiasis. *Austral N Zealand J Surg.*, 1946, 16, 14.

The author reviews the surgical hazards and results of 421 operations on the biliary tract. The pathological condition, the type of operation performed, and the causes of death in each group are discussed.

Two hundred and seventy five cholecystectomies were performed for chronic cholecystitis and cholelithiasis, with 6 deaths—one due to pulmonary embolism, 3 to hepatorenal syndromes, and 2 to internal hemorrhage. Cholecystostomies were done in 3 cases, with no deaths.

When surgical treatment was carried out in the presence of acute inflammatory changes in the gall

bladder the mortality rose from 2.18 per cent to 18.4 per cent. In all, 103 cases were recorded in this group and the pathological findings at operation included acute cholecystitis with commencing gangrene, perforation and peritonitis, cholecystoduodenal fistula, pancreatitis communicating with liver hydatid and empyema of the gall bladder.

Cholecystectomy performed in patients with acute cholecystitis carried with it a mortality of 20.6 per cent whereas the mortality following cholecystostomy was 15 per cent, despite the fact that it was selected for the poor risk cases.

The question whether cholecystitis in the acute stage should be treated conservatively or with immediate operation is discussed at length. Muir believes that generalization is impossible and that each case of acute cholecystitis should be treated on its merits, the patient being under observation in the hospital. Consideration of the local pathological process should always be borne in mind. Apart from a small proportion of welchii infections the organisms causing cholecystitis are usually *Bacillus coli* and streptococci of low virulence. In the early stages the inflammatory process is catarrhal in type and limited to the mucous membrane and submucous tissue. Provided there is no obstruction the tendency in first attacks is to subside, leaving local adhesions on the peritoneal surface of the organ and a thicker gall bladder wall.

The theory is advanced that in a number of cases of acute cholecystitis, mechanical and circulatory effects rather than bacterial infection are responsible for the principal pathological changes. The veins draining the gall bladder are much more closely incorporated with the cystic duct than is the cystic artery and so lead to edema, congestion, and infarction.

The necessity for immediate operation on the tender palpable gall bladder it is argued, is based on the fact that the tension in the gall bladder may become so great that the blood supply is compressed resulting in gangrene, that there is seldom any clinical indication during an attack of acute cholecystitis that pus is present, and that perforation in a "watched" case is frequently the first indication that the attack is not subsiding.

These complications of nonresolving acute cholecystitis are arguments in favor of early surgical intervention. There is little doubt that in a younger type of patient, whose liver function has not been impaired by numerous attacks of cholangitis, cholecystectomy performed in the early catarrhal stage, when the normal surgical anatomy is not badly obscured by inflammatory exudate—that is, during the first forty-eight hours—is not a very formidable technical undertaking and the risk is not great. It must be remembered, however, that these patients are not always seen at that stage and have usually been sick at home for several days before admission to the hospital, so that the day of admission is by no means the first day of the attack. A careful history and assessment of the local pathological process as a

guide to the time of operation are therefore most necessary. If the patient is not seen until the fifth or sixth day the gall bladder will be surrounded by adhesions and considerable local serofibrinous exudate will be present. There will be difficulty in securing the proper plane of separation of the gall bladder from the liver and, also, owing to troublesome oozing and friability of tissue in subsequently peritonizing the gall-bladder fossa when the organ has been removed. In such cases the hepatoduodenal ligament is always swollen and edematous, and the veins between its folds are engorged and bleed readily quite unlike minor vessels encountered there in cases of chronic cholecystitis. The cystic lymph glands will also be enlarged and inflamed.

These facts will make the clear dissection of the cystic duct a difficult matter and failure to secure the cystic artery and the perpetual bugbear of damage to the common bile duct become real dangers. In such cases these dangers can be avoided by performing a cholecystostomy (if necessary under local anesthesia) should immediate surgery be warranted by the progress of the condition.

Careful analysis of the records of acute cases in the series showed that one-half of the operations were carried out within 48 hours of admission of the patient to the hospital, and in about 50 per cent of the acute cases in which operation was performed actual empyema of the gall bladder existed. Because of this, it is believed that had cholecystostomy been performed only as a temporary life-saving measure, instead of cholecystectomy, 5 deaths from reactionary hemorrhage and 3 from biliary peritonitis would presumably not have occurred and the mortality figure would have been reduced to 11.6 per cent.

Conversely, it is argued that of 243 admissions on the medical side of the hospital for cholecystitis, and investigated for suspected cholelithiasis during this same period, the condition in 54 patients was diagnosed as acute cholecystitis, and all except 3 recovered satisfactorily which confirms the estimate that only from 5 to 7 per cent of acute cases progress to a stage requiring urgent operation.

In the series, exploration of the common bile duct for the removal of stones was combined with cholecystectomy and cholecystostomy in 34 cases with 7 deaths—a mortality rate of 21 per cent—which is a very serious rise compared with 2.15 per cent in uncomplicated cholecystectomy.

Three patients were operated upon for stones over looked in the common bile duct at a previous cholecystectomy. In each case the second operation was performed within 2 years of the previous operation. In 1 case the stone was impacted in the sphincter of Oddi, and was removed by a transduodenal approach. In the 2 other cases it was removed through the supra-duodenal portion of the duct. All 3 patients had suffered from repeated attacks of intermittent jaundice and pain, with occasional attacks of fever since cholecystectomy and all made a good recovery.

Two patients with common duct stricture were listed for treatment following cholecystectomy

performed for acute cholecystitis, 9 months and 1 year previously. One patient had submitted to 2 operations to relieve the stricture. Temporary success for 6 months was obtained but the old symptoms returned and death from liver failure took place 1 year later. The second patient is well 2 years after operation, but from time to time suffers from attacks resembling mild biliary colic.

The causes of death in order of frequency were pulmonary complications such as embolus and pneumonia, internal hemorrhage (secondary and reactionary) liver failure, hepatorenal syndrome, uremia, biliary peritonitis congestive heart failure hematemesis, and hyperpyrexia.

STEPHEN A. ZIEGLER, M.D.

Tanna, I. T.: Splenectomy: An Analysis of 38 Cases. *Surgery* 1947 1: 46.

The author analyzed the results of 38 splenectomies performed at the Charity Hospital New Orleans during the period from January 1, 1939 through 1945 exclusive of those done for trauma or those done during the course of esophagectomy or total gastrectomy.

Eleven splenectomies were done for congenital hemolytic anemia. The follow-up studies, ranging from 3 months to 3 years, showed excellent results in 8 of the 11 patients. There was slight improvement in 1 patient in whom it was believed that accessory spleens had not been removed and 2 patients died. One patient died immediately after operation from peritonitis and pericarditis, and the other died 9 years later.

One splenectomy was performed for acquired hemolytic anemia. This patient died on the first post operative day from hemorrhage caused by a slipped ligature upon the splenic pedicle.

Four splenectomies were performed for idiopathic thrombocytopenic purpura. These were done under general anesthesia. All of the patients had received blood transfusions before, during, and after the operation. The results were excellent in 3 patients the fourth one died as a result of continuous oozing from the splenic bed.

Ten splenectomies were performed for Banti's disease. Only 4 patients obtained fairly good results from this procedure. 4 patients showed no improvement in their condition, and 2 died.

In these cases it is necessary to determine the site of portal obstruction before rational therapy can be instituted. One can predict, on the basis of liver function chemistry whether the portal hypertension is due to intrahepatic (portal cirrhosis) or extra-hepatic portal bed block. If the liver is the site of the portal block i.e. portal cirrhosis is manifested by deficient liver function, splenectomy alone will not effect a cure. In this type of case it is necessary to perform a portocaval shunt in addition to the splenectomy. The nonstature method of anastomosis between the portal and caval systems can be effected by the use of vitallium tubes. Even when the block is extrahepatic but proximal to the entrance of the

coronary vein into the portal system, splenectomy alone will not effect a cure. It is only in the case in which the obstruction is distal to the entrance of the coronary vein into the splenic vein that splenectomy alone will give a satisfactory result with relief of hematemesis, anemia, leucopenia, and thrombocytopenia.

One splenectomy was done for splenic neutropenia which resulted in marked improvement of the general condition of the patient.

Six splenectomies were performed for sickle-cell anemia, with poor results. The value of splenectomy in this condition is doubted by most authorities, because lymph nodes and other reticuloendothelial tissue may carry on the phagocytic function of the spleen even if it is conceded that the spleen is responsible for deterioration of the red blood cells.

One splenectomy was performed for torsion of the spleen. At operation the spleen was enlarged and twisted 3 times upon itself. Pathologically the spleen showed thrombosis of the hilar vessels and massive splenic infarction. The patient made a remarkable recovery.

One splenectomy for aleucemic leucemia and 3 splenectomies for splenomegaly of undetermined etiology gave poor results.

On the basis of his study Tanna concluded that splenectomy is definitely indicated for congenital

hemolytic anemia, idiopathic thrombocytopenic purpura, splenic neutropenia, and splenic torsion. Careful evaluation is in order before splenectomy is performed for Banti's disease. Splenectomy is of little or no value in patients with sickle cell anemia, aleucemic leucemia, and those with splenomegaly of unknown origin.

ROBERT TURKEL, M.D.

MISCELLANEOUS

Sperling L. Basher L. H. and Zimmerman H.: *Surgery of War Wounds of the Abdomen. Surg. 1947 21: 258.*

In 100 consecutive cases of abdominal injury 14 deaths occurred. Eleven deaths occurred among 74 cases of injury to multiple hollow viscera. This mortality rate is much lower than that of the first World War and compares favorably with recent publications from World War II.

It is difficult to ascribe the lowering of the mortality rate to any one specific factor. penicillin, sulfadiazine, blood plasma and watchful postoperative treatment were all important factors. However the proper treatment of shock was probably the most important single factor. Adequate decompression of the bowel by gastric suction siphonage before, during and after surgery surely played an important role.

SAMUEL KAHN, M.D.

GYNECOLOGY

UTERUS

Mazzullo, B.: Cancer of the Uterus at a Youthful Age. A Gynecostatistical Contribution (Il cancro dell'utero in età giovanile. Contributo ginecostatistico). *Gli ologia, Tor* 1946 13 33

A clinical report of 4 cases of carcinoma of the uterus occurring in young women of less than 30 years of age is given. These cases were among a series of 109 cases of carcinoma of the uterus treated in the Obstetrical and Gynecological Clinic of the Maternity Hospital of Torino during the 10 year period between 1933 and 1942 and made up 3.6 per cent of the total number of cases of uterine cancer.

In a preface before presenting the individual cases, the author discusses carcinoma of the uterus in general and stresses the fact that this disease is not a postmenopausal disease, but one that occurs most frequently in women from 30 to 35 years of age, during the period of greatest sexual activity.

Case 1 was that of a housewife of 29 years with negative family and past histories, who had borne 3 normal children. Three months prior to entry into the hospital, the patient developed a fetid leucorrhoea streaked with blood which increased in amount and was finally succeeded by severe vaginal hemorrhages. She had begun to experience low back pain. Physical examination revealed the presence of enlarged inguinal lymph glands. Vaginal examination revealed a bloody vaginal discharge, a large indurated ulceration of the whole anterior lip and one-third of the posterior lip of the cervix; the uterus was not enlarged but there was dense parametrial infiltration. Biopsy revealed a spinocellular type of carcinoma of the cervix. A diagnosis of inoperable cancer of the cervix was made. The patient was treated with radium and x rays. She recovered satisfactorily and was discharged apparently free from her symptoms.

Case 2 was that of a housewife of 27 years with negative family and past histories who had borne 2 children. During the second pregnancy a carcinoma of the cervix was found which had been causing symptoms for about a year. The patient was given radium therapy, the pregnancy proceeded to term, and a normal child was delivered. Soon after delivery a blood streaked leucorrhoea developed and on vaginal examination an extensive ulceration of the whole anterior lip of the cervix was discovered; the uterus was not enlarged and it was mobile in all directions. There was no apparent parametrial infiltration. Biopsy revealed a spinocellular carcinoma of the cervix. A vaginal hysterectomy was done, and 35 days later the patient was discharged from the hospital. For three years follow-up examinations revealed no sign of return of the disease.

Case 3 was that of a 28 year old housewife with negative family and past histories, who had borne a normal child. A second pregnancy was interrupted

spontaneously and a curettage was performed. Two months later the patient developed an abundant blood streaked leucorrhoea, especially abundant after sexual intercourse. Vaginal examination revealed a fetid serousanguinous cervical discharge; the cervix presented a characteristic irregular ulceration of the posterior lip of the cervix, of hard consistency and friable. The body of the uterus was not enlarged, but it was mobile in all directions. The parametrium was free. Biopsy revealed a spinocellular carcinoma of the cervix. A vaginal hysterectomy was performed and 20 days later the patient was discharged from the hospital. Nothing further was seen of the patient as she failed to report for postoperative follow-up.

Case 4 was that of a 29 year old housewife with negative family and past histories she had borne 3 normal children. Two months before entry into the hospital, she developed a leucorrhoea and had subsequently suffered vaginal hemorrhages, especially severe after sexual intercourse and douching. She had developed pain radiating from the pelvic region to the suprapubic, inguinal, and lumbosacral regions. Physical examination revealed a compensated mitral insufficiency. Vaginal examination revealed a cervix with extensive ulceration characteristic of neoplasm. The body of the uterus was fixed and the parametrium was infiltrated. Biopsy revealed a spinocellular carcinoma of the cervix. The patient was given radium and x ray treatment, but she died 3 months after entry into the hospital of cardiac collapse.

These cases demonstrate that carcinoma of the uterine cervix affects young women at the height of their sexual activity. A family history of neoplastic tendencies is lacking. The patients have borne normal children. The initial sign of the disease is the development of a fetid, blood streaked leucorrhoea (all 4 cases) which rapidly increases in severity and finally is replaced by vaginal hemorrhage. General trauma as from accidents and local trauma as from sexual intercourse and douching serves to increase the bloody discharge. Pain (cases 1 and 4) is a late sign and usually denotes extension of the disease to the uterine body, the parametrium, and to the regional and inguinal lymph nodes. Vaginal examination reveals the extensive ulceration of the cervix characteristic of neoplasm (all 4 cases). The uterus is mobile and not enlarged (cases 2 and 3) if there has been no extension of the disease into this organ and the parametrium. If such extension has taken place (cases 1 and 4) the uterus is fixed and the parametrium infiltrated. Biopsy reveals a carcinoma of the cervix of the spinocellular type (all 4 cases).

Treatment given by the author consists of vaginal hysterectomy (cases 2 and 3) if the examination shows no sign of extension of the disease from its original focus. The patient in case 3 in this series was well 3 years postoperatively. The patient in case 3 disappeared from the control of the author and

no postoperative report is available. In cases in which the disease has extended from its original focus (cases 1 and 4) as is shown by fixation of the uterus, parametrial infiltration and enlargement of local and regional lymph nodes, x ray and radium treatment is given. Case 1 of this series was treated apparently successfully with radium and x rays. The patient in case 4, also with extension of disease into the body of the uterus and parametrium, died early after treatment from cardiac complications due to a long standing mitral insufficiency. Case 2 in which the patient was found to have carcinoma of the cervix during pregnancy was treated with radium and a normal child was delivered at term. The treatment given did not eradicate the disease as the patient developed a fetid blood streaked vaginal discharge shortly after delivery. She was then subjected to a vaginal hysterectomy. This leads the author to treat doubtful cases by complete hysterectomy (vaginal or abdominal) first and if signs of extension are present or suspected he resorts to x ray and radium treatment.

Every young woman who develops a fetid blood streaked leucorrhea should be subjected to a careful and thorough physical examination the gynecologist being mindful that this sign is the most important initial symptom of cancer of the cervix.

BLACKWELL MARKHAM M D

Pollack, R. S., and Taylor, H. C., Jr.: *Carcinoma of the Cervix during the First Two Decades of Life.* *Am. J. Obst.* 1947 55 135

The apparent tendency of cancer to manifest itself during the earlier decades of life is a fact that bears emphasis. It should be evident that no age barrier exists excluding the development of adult lesions in young people.

The authors report the occurrence of cancer of the cervix in an 18 year old woman. The patient presented symptoms of vaginal bleeding at irregular intervals for a period of 5 years before being seen by the authors. During this time she had been seen by several physicians but had never had a pelvic examination. Various forms of codocine therapy had been given. A biopsy was finally made, which revealed an adenocarcinoma of the cervix. Clinical examination placed the lesion in group 3. In spite of adequate radiological treatment she ran a slowly progressive downhill course.

Thirty cases of carcinoma of the cervix in women 20 years of age and younger are reviewed from the literature. The authors point out the fact that the diagnosis is too often delayed in these cases because of the patient's age. In spite of treatment the course was usually progressively downhill, and of this group only 4 patients have survived 5 years.

JOHN R. WOLFF M D

Miller N F., and Henderson C. W.: *Corpus Carcinoma.* *Am. J. Obst.* 1946 52 894.

The authors present a review of 322 cases of corpus carcinoma which have come under their care

since 1931 all patients have been traced. The plan of treatment was based on the assumptions that elimination of the primary neoplasm could best be achieved through complete surgical extirpation of the entire uterus tubes and ovaries and that supplemental irradiation therapy should be most beneficial when given prior to operation thereby causing widespread damage to cancer cells, minimizing manipulative spread at operation and at least partially obliterating the lymphatics. In the planned treatment of choice the decision to use deep x ray therapy in preference to radium was based on its known effectiveness in neoplasia of the cervix, its helpfulness in prolonging the lives of some patients with ovarian carcinomas and its broader field of irradiation which might also damage neoplastic cell masses sometimes found in the tubes and ovaries of patients with carcinoma of the uterus (7 times in 96 patients operated upon).

In the authors experience preoperative x ray therapy proved to be a valuable adjunct to total hysterectomy and bilateral salpingo-oophorectomy. In the treatment of carcinoma of the uterus. Its use clears up uterine infection, reduces the size of the uterus and decreases pelvic hyperemia thereby facilitating operation. It has not in any discernible way interfered with wound healing. Because for most patients this is an outpatient procedure the 3 weeks required for its administration is not a serious drawback.

The results obtained with preoperative x ray treatment warrant its continued use at least until some other combination or new form of therapy has proved to be more satisfactory. The use of very high voltage x rays as a preoperative measure in carcinoma of the uterus appears promising and should be explored further. On the basis of available data, the relative merits of preoperative x ray versus radium could not be stated.

JOHN R. WOLFF M D

ADnexAL AND PERIUTERINE CONDITIONS

Smith F. G.: *The Pathology and Physiology of Struma Ovarii.* *Arch. Surg.* 1946 53 603

Thyroid tissue develops fairly frequently in ovarian dermoids although it is usually no more than a microscopic portion of the tumor. There is however a rare type of ovarian tumor known as struma ovarii in which thyroid tissue is a major constituent. Some of these ovarian goiters are obvious teratomas containing besides thyroid, such tissues as skin teeth, brain and intestinal epithelium. Others consist entirely of thyroid or of thyroid in association with a cystoma. Gottschalk in 1899 described an ovarian tumor composed entirely of thyroidlike tissue.

It is the purpose of this paper to describe the pathologic changes and functional activity of thyroid tissue in ovarian tumors. The study is based on the investigation of a case of struma ovarii and an analysis of 152 previously published reports of cases. Ovarian tumors containing thyroid tissue occur at all ages. Merittens reported the case of a 6 year old

girl, and Heinsen that of a woman of 74. Dermoids constitute the largest group of tumors which exhibit thyroid tissue. Seventy six of the tabulated cases fall in this group. In 47 cases a serous or pseudomucinous cyst has been described in combination with a solid tumor consisting of thyroid tissue without other recognizable teratomatous elements. Thyroid tumors occurring alone, without cystoma and without other teratomatous elements (but not excepting bone or cartilage) are listed 26 times in the series. These are the cases of so-called pure struma ovarii. The smallest tumor of this sort was a 6 mm. nodule of thyroid tissue found by Masson and Mueller at autopsy of a 38 year old woman who had died of thyrotoxicosis and hepatic atrophy. Tumors the size of a child's head have been reported.

A tumor of the opposite ovary has been reported in 81 cases of struma ovarii. Thyroid tissue was present bilaterally in 6 cases.

Ascitic fluid was found in 26 cases an incidence of 17 per cent.

Dissemination of these tumors has occurred in a few instances. Three distinct types of metastasis have been found: local implants on the peritoneum and omentum, regional spread with nodules in the liver and distant metastasis.

Cervical goiter has been recorded 25 times in the entire series of 253 cases, an incidence of 10.3 per cent.

The tissue is identical with the structure of the thyroid gland. The colloid is homogeneous tends to retract from the epithelium, and is frequently vacuolated. The staining qualities are those of colloid, not mucin or pseudomucin. The struma is delicate, and interfollicular cells are numerous. There is evidence of various levels of physiologic activity. A histologic appearance of malignant growth has been described repeatedly. The borderline between physiologic and neoplastic processes is still vague. Graham considered invasion of the blood vessels the only reliable distinction between benign and malignant adenomas. Adenomatous proliferation with struma ovarii has been described.

Some of the otherwise pure thyroid, or cystoma with thyroid, tumors contained foci of calcification, or the formation of bone or cartilage. Since bone and cartilage may develop widely in the body the authors exclude this as a special quality of teratomas.

Investigation of the iodine content of the thyroid tissue has been undertaken in 32 cases. In 15 cases the results were negative qualitative tests were reported as giving positive results in 5 cases. 15 quantitative determinations have demonstrated iodine in varying amounts. The maximum values recorded are those of Emge (5.018 mgm. of iodine per gram of wet tissue) and of Masson and Mueller's first case (1.05 mgm. of iodine per gram of dry weight). These concentrations correspond to the iodine content of the normal adult thyroid gland.

Plaut's results indicate that in struma ovarii, as in the thyroid gland the biologic activity parallels the iodine content.

Symptoms of thyrotoxicosis have been frequently cited as evidence of the physiologic activity of struma ovarii. Seven patients seem to have shown significant alleviation of symptoms following operation.

The origin of thyroid tissue in ovarian tumors has been explained in various ways. It has been denied that the tissue is true thyroid. Gottschalk considered the tumor a follicularoma. In approximately half of the cases of struma ovarii the tumors exhibit other tissues obvious to foreign to the ovary. These tumors belong to the general class of teratomas. The ovarian tumors which contain only thyroid or thyroid with a cystoma are generally considered to be teratomas in which all other tissues have undergone regression.

A case is reported in detail and the literature is reviewed. There is a complete bibliography.

D. VINCE MORROW, M.D.

LINARD, R.: V. Metastatic Bilateral Carcinoma of the Ovary or Krukenberg Tumor (Carcinomes métastatiques bilatéraux des ovaires ou tumeurs de Krukenberg). *J. chir. Par.* 1937, p. 63.

This exhaustive study covers 165 cases of Krukenberg tumor which were published since 1927 including 6 of the author's own observation.

Although occurring at all ages, the tumor is most frequent in individuals between 30 and 40 years of age and comparatively rare in those past the menopause; therefore it seems that the functional activity of the ovary is a contributing factor to metastases into this organ.

The primary tumor could be ascertained in 139 of the 165 cases, either by operation or at autopsy. As to the clinical course four different types of tumor can be differentiated. The first found in about 50 per cent of the cases, present no gastrointestinal symptoms and their only sign is the increase of the abdominal volume, with or without amenorrhea. These cases are sometimes mistaken for pregnancy. In 3 instances torsion of the pedicle with severe pain, ascites, and hyperpyrexia led to the operation. In the second group including about a third of the cases the gastrointestinal symptoms were observed first and in the vast majority of the cases the stomach or the colon, especially the sigmoid was the site of the primary tumor. Two cases of this group were caused by a tumor of the appendix complicated by phlegmonous appendicitis. Only months or years after the surgery of these tumors were signs of metastasis in the ovary observed (increase of abdominal volume, amenorrhea, and sometimes neuralgias of sciatic type). In the third group (15%) signs of a mass in the lower abdomen coincided with signs of gastrointestinal disturbances so that the correct diagnosis was possible prior to laparotomy.

The fourth clinical group showed signs of generalized carcinomatosis, and only on the postmortem table was the invasion of the ovaries found.

Pathologic anatomy. Although in the vast majority of the cases the site of the primary tumor was in the digestive tract mostly in the stomach other locations, especially the mammary gland and the

uterus, may also be accompanied by bilateral metastases in the ovary. Among the 139 cases the primary tumor was found in the stomach in 95 cases, the small intestine in 2, the colon in 19, the appendix in 2, the pancreas in 3, the gall bladder in 2, the adrenal gland and the liver in 1 case each, the uterus in 5 cases and the mammary gland in 9 instances.

Histologically the Krukenberg tumor is characterized by pseudoglandular structures isolated elements, especially signet ring cells, and mixed pictures which some authors consider as transition structures. It is, however, no longer justifiable to distinguish between true and false Krukenberg tumors by depending on the presence of signet ring cells. The signet ring appearance is caused by accumulation of mucus in the cell which is characteristic of the carcinoma cell in general and may or may not occur in the ovarian metastases.

Very little is known of the pathogenesis. The question whether the Krukenberg tumor can occur as a primary tumor has for a long time been discussed in the literature. At present the consensus is that it is always a metastatic tumor although some cases have been published in which either the malignancy of the ovary seemed to precede a carcinoma of the gastrointestinal tract, or in which a true Krukenberg tumor was found as the only malignancy on post mortem examination and no primary tumor could be detected in the digestive tract or any other organ.

Another much discussed problem is the way in which the tumor cells invade the ovaries and the reasons for the special affinity of these organs to invading tumor cells. Since the experiments done by Krause, and later by Polano and Amann, the implantation theory has had the greatest number of followers. These investigators injected diluted Chinese ink intraperitoneally in guinea pigs, mice and dogs, and observed that the ink particles penetrated freely into the ovary.

The author criticizes this theory for various reasons. In the first place the implantation theory would demand that, to be implanted in the ovary, the cancer cells reach and ulcerate the serosa at the site of the primary tumor. It has, however, been demonstrated that in many cases the primary tumor in the stomach did not even reach the muscularis, much less involve the peritoneum. One cannot possibly imagine how in these cases, the tumor cells could have invaded the peritoneal cavity and reached the ovary in this way. Furthermore, exact histological investigations have never shown the presence of tumor cells at the surface of the ovary, rather the tumor originates in most cases from the central parts of the organ. In view of these facts, the author rejects the implantation theory.

He believes that the old theory of retrograde lymphatic invasion explains best the observed facts, and is supported by many detailed investigations. It has been shown in a great number of cases that the first invasion of carcinomatous cells occurred in the central part near the hilus of the ovary. Here the lymph vessels were filled with tumor cells which in-

filtrated into the surrounding tissue. This was observed also in cases in which the organ appeared normal macroscopically. The hypothesis of retrograde lymphatic infiltration would also explain the metastases from breast carcinoma to the ovary which cannot possibly be explained by the implantation theory.

Many hypotheses have been offered to explain the special predisposition of the ovary to develop metastases. Changes in the surface tension and in the pH may be contributory factors. Several men have observed that lowering of the surface tension stimulates and accelerates cell division. Extracts of malignant tumors have a lower surface tension than those of normal tissues. The same is true for the ovary and lymph nodes whereas the spleen and the muscles which rarely are sites of metastases have a higher than average surface tension. As to the pH it has been shown that the blood of carcinomatous patients has a more alkaline reaction than normal blood and that cancer cells grow much faster in an alkalized medium. On the other hand, the normal ovary and the lymph nodes have a slightly more alkaline reaction than the other tissues so it is conceivable that the tumor cells which circulate in the lymph stream are more apt to invade the ovary than other organs.

The prognosis is poor. Of 40 cases on record in which the primary tumor as well as the Krukenberg tumor in the ovary was removed, only 3 patients survived for more than 3 years.

WERNER M. SOLMATEL, M.D.

Holm Nielsen P: Injuries Caused by Hysterosalpingography *Acta obst. gyn. scand.*, 1946, 26: 565

The author reviews the recent literature as well as his experiences concerning the use of various iodized oils in roentgen visualization of the genital tract with particular reference to complications.

The most frequent complications are of an inflammatory nature, of which there are three main types: (1) recurrence of old adnexal inflammations, (2) primary adnexal inflammation following salpingography and (3) diffuse peritonitis resulting from the examination.

Of these the last 2 are of the most importance since they indicate infections produced by the examinations in previously normal individuals. In the patients in whom there is a flare-up of an old process there usually was noted a retention of the contrast medium in the tubes due to blocking of the distal ends. However, this does not mean that the inflammation is a result of irritation from the oil, more likely it is due to the manipulation associated with the examination. The absorption of oil from these tubes is very slow and evidence of its presence may be demonstrated for years. Also if the examination is carried out near the time of a menstrual period a flare-up may occur as ordinarily recurrences take place during or near such a period.

However, the incidence of inflammatory complications is difficult to ascertain. In two series of 300

Later abdominal distension, ascites and an extensive pelvic mass are found, accompanied by emaciation and cachexia. If a tubal lesion is thought of or suspected in an obese individual, examination under anesthesia, with preparation for immediate abdominal operation if a definite adnexal mass is found, is the procedure of choice.

The procedure should be complete abdominal hysterectomy with bilateral salpingo-oophorectomy rather than simple removal of the affected tube and/or ovary. Postoperative irradiation is indicated when operation has been, of necessity incomplete and the diagnosis of malignancy has been made in the laboratory or when metastases are observed. The question of irradiation therapy when operation has been complete, and when no metastases are visible, is debatable.

The prognosis of tubal sarcoma, as well as of tubal carcinoma, is doubtful at best. Curability can be enhanced only by early diagnosis and prompt treatment. The latter in the final analysis, can be made possible only by a keen appreciation of the symptoms and findings, but more probably by the periodic pelvic examination of women through continued lay and professional education. JOHN R. WOLFF, M.D.

MISCELLANEOUS

Meigs, J. V. and Ingersoll, F. M.: Thrombophlebitis and Phlebothrombosis in Gynecologic Patients: The Prophylaxis, Recognition and Treatment. *Am. J. Obst.* 1946 52: 938.

Because of the seriousness of embolism in cases of thrombophlebitis, a means was sought to prevent fatalities from this cause in postoperative patients. In the autopsy room, it was definitely shown that

nearly all fatal emboli come from the veins of the legs. The general plan of surgeons, urologists, and gynecologists of the Massachusetts General Hospital, Boston is to try to prevent pulmonary embolism whenever possible by ligating the proper veins in patients who have a suggestion of thrombophlebitis or phlebothrombosis and to interrupt definitely the femoral veins of those patients who have had a sublethal pulmonary embolus or infarct.

Diagnostic signs and symptoms indicating involvement of the leg veins and concomitant changes in pulse, temperature, and respiration, suggestive of a small unrecognized pulmonary infarct are presented. Various methods used in the attempt to prevent the formation of phlebitis or thrombosis in the legs of postoperative patients are discussed by the authors.

The details of surgical treatment are given the authors maintaining that both legs must be operated upon. Prophylactic interruption of veins is favored particularly in patients 60 years of age or older in which group most fatal emboli occur and especially in patients who have had phlebitis or an embolus following a previous operation.

There was no immediate mortality among 1,057 patients with vein interruption 75 of whom were gynecologic patients and except for an occasional lymphorrhea from the wound no serious complications have occurred.

Surgeons of the Massachusetts General Hospital are all convinced that interruption of the femoral veins is essential after a sublethal embolus or infarct. Nearly all are agreed that interruption of the femoral veins is essential after the diagnosis of thrombophlebitis and phlebothrombosis has been definitely made. JOHN R. WOLFF, M.D.

thus each cubic centimeter of the mixture contains 0.025 gm. of pentobarbital and 0.00006 gm. of scopalamine. When the patient begins to have regular pains at 4 to 5 minute intervals, which last for 30 or more seconds, the material is injected intravenously. An initial 3 to 4 c.c. are given at a rate of 1 c.c. every 5 to 10 seconds then it is slowed to 1 c.c. every 30 seconds until the patient falls asleep or talks incoherently. The average initial dose was 10 c.c. and the dosage varied from 6 to 20 c.c. Subsequent injections of about 2 c.c. are given when the patient becomes restless during contractions, does not sleep or becomes lucid between contractions.

Analysis of the results in 170 patients indicate that 89.4 per cent had complete amnesia while 10.6 per cent had partial amnesia. In 10.6 per cent of the patients there was some retardation of labor and in 2.9 per cent the contractions ceased completely. Three patients became unmanageable and required morphine in addition to the pentobarbital-scopolamine mixture. A severe fall in blood pressure occurred twice, and severe respiratory depression was noted once. One maternal death associated with cyanosis dyspnea, a fall in blood pressure, and a rise in pulse rate, occurred. Ninety two and four tenths per cent of the infants breathed spontaneously, 7.6 per cent required resuscitation and of these, 1 died.

The author believes that this is an efficient and safe method for obtaining satisfactory amnesia during labor.

J. ROBERT WILLSON M.D.

Belvedere C.: Clinico-statistical Data and Observations on Podalic Birth in the Obstetrical and Gynecological Clinic of Bologna (Dati e rilievi clinico-statistici sul parto podalico nella Clinica Ostetrica e Ginecologica di Bologna) *Riv. Ital. Ginec.* 1945 18 150

The author reports on the podalic births occurring in the Maternity Clinic of the Obstetrical and Gynecological Hospital at Bologna for the 10 year period from January 1 1935 to December 31 1944. Seven hundred and forty-seven podalic births occurred among a total of 19 125 births during this period. Of the 747 infants 355 (47.52%) were males while 392 (52.48%) were females.

Of the mothers, 283 (38.71%) were primiparas under 30 years of age, 102 (13.95%) were primiparas over 30 years of age and 346 (47.33%) were multiparas.

In 633 cases the births were single births. In 99 cases, they were twin births. Among the twin births 32 (33.33%) of the mothers were primiparas and 67 (67.67%) were multiparas.

In 67 cases (67.67%) the fetuses were born one in cephalic presentation and one in podalic presentation and the fetus in the podalic presentation was born first in 24 of these cases (35.81%).

In 16 cases (16.16%) both fetuses were born in podalic presentation and in 16 cases (16.16%) one fetus was in podalic presentation and the other in shoulder presentation, and the fetus in podalic presentation was born first in 13 of these cases (81.25%).

Whenever the fetuses were in longitudinal position (cephalic-podalic presentation) the fetus in the cephalic position was most often born first. When the 2 fetuses were in the podalic presentation and shoulder presentation, respectively the fetus in podalic presentation was most often born first.

The course of pregnancy was perfectly normal in 578 (77.66%) of the mothers, while in the remaining mothers (169) it was complicated by some morbid condition. The morbid conditions complicating pregnancy were (1) conditions occurring in the mother independent of the pregnant state, (2) morbid conditions depending on the pregnant state, (3) anomalies manifest during the course of labor, and (4) anomalies of the fetus which caused difficulty at the time of labor. Of the diseases affecting the general condition of the mother, the most important were pulmonary tuberculosis (6 cases), the various cardiopathies (13 cases) diabetes mellitus (1 case) and lues (10 cases). Among the conditions resulting from the pregnant state there were the various nephropathies (48 cases) eclampsia (8 cases) and cystopyelonephritis (8 cases). Among the anomalies verified at the time of labor there were prolapse of the cord (19 cases) and placenta previa (8 cases). Among the complications caused by abnormalities of the mother there were contracted pelvis (30 cases) fibroma of the uterus (3 cases) deformity of the uterus (1 case) and polyhydramnios (3 cases).

Of the women with pulmonary tuberculosis (3 primiparas and 3 multiparas) 3 were delivered by podalic version the method of Krause, and 2 were delivered spontaneously in the last the pregnancy was interrupted at the seventh month by the method of Krause.

Of the women with cardiopathy (5 primiparas and 8 multiparas) 4 were delivered spontaneously and 5 by podalic version. In the remainder (4) the pregnancy was interrupted by the method of Krause.

Of the 8 women with eclampsia (7 primiparas and 1 multipara) 3 were delivered by cesarean section 2 by podalic version, and in 2 the pregnancy was interrupted by the method of Krause. Two of the women with eclampsia died immediately after delivery while a third one died on the fourth day of the puerperium.

Of the women with prolapse of the umbilical cord (4 primiparas and 15 multiparas) 17 were delivered by podalic version and 2 were delivered spontaneously.

Of the 4 women with central placenta previa and 4 with marginal placenta previa 2 were primiparas and 6 were multiparas. Two were delivered spontaneously 5 by podalic version and 1 was delivered by cesarean section.

Of the 30 women with contracted pelvis 10 were delivered spontaneously 11 by podalic version, 8 by cesarean section and 1 was delivered by craniotomy.

Presentation. Of the 747 fetuses in podalic presentation 117 were born in complete podalic presentation and 601 in incomplete podalic presentation in

The theory of resuscitation of the newborn is discussed in detail. The respiratory rhythm in extrauterine life, as it was formerly in intrauterine life, is cultivated essentially by chemical stimuli. After birth the bulbar centers of respiration are subjected to the influx of many afferent impulses, the most important of which act on the respiratory apparatus distention and retraction of the lungs and passage of air into the bronchial tree and originate in the carotid sinus (chemical stimuli which cause a variation in the composition of the blood). The fetus moreover comes to react to its surroundings (contact of air and temperature on the skin and mucosa, which leads to many reflexes on the neurorespiratory system).

The essential basis of the antiasphyxia treatment is the theory that a low oxygen tension in the blood stimulates the bulbar centers, while a further diminution of oxygen in the blood provokes a loss of excitability of the centers, the cells of which are very sensitive to the lack of oxygen. Oxygen determines the sensitivity of the neurorespiratory center, which then becomes capable of reacting to the specific stimulus carbonic acid. Anoxemia, which lasts for a certain time, represents a positive stimulus for the re-establishing of the center with oxygen, otherwise all the vital functions are destined to be extinguished. Only a further increase in the tension of carbonic acid can compensate for the time being for the lack of oxygen and overcome the elevation of the threshold of excitability of the center. The low oxygen tension and the high carbon dioxide tension of the blood which are constantly present in the last months of pregnancy and which in a degree maintain intrauterine respiratory rhythm, are not able to stimulate the bulbar centers after birth, as these centers become sluggish and insensitive in spite of a noteworthy increase in carbon dioxide tension. In this condition (oligopnea, or apnea, conservation of muscular tone, reflexes, and cyanosis) the spontaneous increase of carbon dioxide does not succeed in overcoming the excitability of the threshold of the centers; then, an increase of oxygen and eventually an increase of carbon dioxide occurs (according to Henderson the relations go to 10 for a short period of time and then it becomes 70 to 30). In this way cases of anoxemia of great seriousness and duration (apnea, loss of tone, absence of reflexes) are produced and only the immediate increase of oxygen can assure life of the newborn.

In 1938 the author performed autopsies on babies who had died from asphyxia directly after birth or a few days thereafter. His study revealed that in certain cases death was the result of improper treatment. The most common errors were

1. A tendency to proceed immediately with treatment without following certain indispensable preliminary measures, above all, without ascertaining whether the airways are completely unobstructed. Many babies were asphyxiated on account of the presence of meconium, amniotic fluid, blood, or mucus in the airways. No method of resuscitation would be successful unless the airways were unobstructed.

2. Utilization of brutal and inefficient methods of resuscitation.

3. Lack of respect for indications and contraindications for certain methods of treatment. Autopsies showed that apnea was accompanied by or provoked by hemorrhagic effusions, prematurity and interference with extrauterine respiration, oftentimes apnea was secondary to cerebral compression. In the condition of grave asphyxia, often energetic measures which are dangerous are employed. A method of resuscitation, such as that of Schnitzle, might be dangerous in babies with cerebral hemorrhage. All methods of manual artificial respiration used on babies which are nude and exposed to cold atmosphere might predispose to a rapid loss of body heat and produce shock in the newborn. On the other hand, hypodermic injection of stimulants when the peripheral circulation has practically stopped is useless and inefficient. Gaseous stimulation is useless when the pulmonary circulation is absent.

4. A tendency to neglect newborn babies after resuscitation has started.

From histological examination of tissues removed from the lungs of babies who were born asphyxiated, then resuscitated by artificial respiration, and subsequently died a few days after birth the author draws the following conclusions:

1. The frequency of large zones of atelectasis in the lungs of the newborn who died after a few days of life shows that it is not necessary for all pulmonary alveoli to be functioning in order to supply the necessary amount of oxygen for metabolism in the newborn. Only a moderate number are required. Methods of resuscitation should not produce hyperventilation of the lungs as this would be harmful to the child.

2. The physiological opening of the pulmonary alveoli is a gradual phenomenon which takes place slowly and is not reproduced artificially in a short time by means of forced endotracheal insufflation; neither is it produced by means of mechanical expansion of the chest obtained by producing highly elevated negative pressure. During insufflation the *vis a tergo* should correspond to a forced pressure of from 5 to 10 mm. of mercury and during mechanical respiration the negative pressure which should be exerted on the thoracic cage should not exceed that of a column of water of 10 c. c. in height.

3. Of the various methods of gaseous stimulation, the best are those in which the gaseous current is breathed by the newborn by active movement of its chest.

4. The procedures of artificial respiration which employ the more modern mechanical means ventilate the alveoli in a more physiological manner and are less harmful than rough manual methods.

A practical program of treatment for resuscitation. In general all apneic or asphyxiated babies should be protected against loss of body heat, dryness and overheating. All resuscitative measures which require the baby to be nude and which require the body temperature to be highly elevated, should not be used. The author considers the respiratory method

GENITOURINARY SURGERY

ADRENAL, KIDNEY AND URETER

Selye, H., and Stone, H.: Pathogenesis of the Cardiovascular and Renal Changes Which Usually Accompany Malignant Hypertension *J Urol* Balt., 1946 56 399

The literature in reference to renal hypertension is briefly reviewed with particular reference to the endocrine activity of the kidney. The authors constricted the aorta between the right and left renal arteries to cause the left kidney to become a function from a urinary secretory standpoint and along with tubular epithelial necrosis or degeneration the organ assumed the appearance of an endocrine gland. The authors found that this endocrine kidney although nonfunctional from a urinary standpoint, was apparently able to elicit the characteristic changes of hypertensive disease in the remaining cardiovascular system. This observation is contrary to the accepted views on the subject since it was thought that a kidney affecting such hypertensive changes must retain the power of urine formation.

The endocrine kidney was found to be responsive to pituitary extracts as demonstrated by cellular activity in the tubular epithelium and volume increase of the organ. Furthermore, the compensatory renal hypertrophy as occasioned by unilateral nephrectomy is inhibited by the endocrine kidney.

Partial constriction of one of the renal arteries was found to protect the affected kidney from nephrosclerosis either of renal or pituitary origin but the opposing kidney was afforded no protection. This finding it was felt, substantiated the belief that increased intravascular pressure was necessary to induce nephrosclerosis in animals.

Perarteritis nodosa was found cranial to the partially occlusive ligature of the aorta and could be induced in animals with anterior pituitary extracts which in addition produced corticoadrenal hypertrophy and hyperplasia. The adrenal vessels in this group frequently showed perarteritis nodosa, with necrosis in some instances this completely destroyed the adrenals except for a small layer of subcapsular cells.

The article is well illustrated and contains a comprehensive discussion and correlation of clinical hypertension in reference to the nephrosclerotic steroids, nephrosclerotic pituitary hormones, and renotropic hormones. ROBERT LEE, JR., M.D.

Sellinger H. and Sanberg, F.: Pyelocopy: An Evaluation of the Method *Acta radiol.*, Stockh., 1946, 27 617

Both intravenous and retrograde pyelography in certain cases leave both morphologic and dynamic facts undiscovered this is due to limitations inherent

in the method. The authors propose pyelocopy a combination of fluoroscopy with renal exposures to improve morphologic demonstration and functional mechanism demonstration. They use small spot films as in gastrointestinal roentgenography and have devised a method of keeping the end of the ureteral catheter sterile while it is being handled in the dark. A compression apparatus for the ureter devised by them, is also employed. In studying the phase of filling the tip of the catheter is inserted into the renal pelvis, just beyond the ureteropelvic junction. As soon as the pelvis has been adequately filled as seen fluoroscopically the catheter is withdrawn to L and the ureter then is filled. The patient is turned as required to demonstrate the entire caliceal system. For study of the morphologic details, the patient is turned and is also studied upright and during extremes of respiration. Fluoroscopic observation and simultaneous palpation is also used. The speed of emptying is then observed fluoroscopically.

Fluoroscopically controlled pelvis filling makes it possible to outline the pelvis before pain or tension, with its sequelae, are felt. When a ureter is kinked or looped on an ordinary film fluoroscopy will easily determine whether a respiratory movement or some similar physiologic effect has caused the ureteral distortion. Palpation during fluoroscopy will often demonstrate the relation of an abdominal tumor with the kidney. Pseudostrictures of the ureter are ruled out by fluoroscopy. When a hyperkinetic pelvis expels the dye during ordinary pyelographic filling, spot films taken at the very moment of filling will demonstrate the caliceal system easily. Lastly a vague defect in the pyelogram may prove to be a pseudopathologic finding and the fluoroscopic observation of the filling of the pelvis (pyelocopy) will demonstrate that the filling defect is purely functional.

The authors conclude that pyelocopy makes up for the shortcomings of intravenous and retrograde pyelography and believe that every retrograde filling should be performed routinely under fluoroscopic control. DAVID ROSENBLUM, M.D.

Begg, R. C.: Physiological Variations in Pyelograms Commonly Interpreted as Pathologic. *Brit J Urol.*, 1946 18 176

The author studied the physiological variations in pyelograms which were commonly interpreted as pathological. He stated that the ureters kidney pelves and calices pass through wide variations in form and position in accordance with bodily movement and posture, variable quantities of urine to be handled fluctuations in the pressure, and the resistance to overcome. Many variations observed in pyelograms, such as nephroptosis hydronephrosis ureteral dilatations, strictures and kinks are not pathological but are rather pictorial representations of

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tion is unwise and usually futile. Heminephroureterectomy is the operation of choice in the average case and nephroureterectomy is favored when an entire kidney is damaged and the opposite one is normal.

When the segment of the kidney drained by the ectopic ureter is originally small has undergone atrophy and is not infected Everett recommends ligation and resection of the abdominal portion only. However if the ureter is dilated, as it usually is the stump may be the source of continued drainage and of very little additional surgery. Renal resection should always be done in conjunction with ureterectomy when feasible particularly when the anomalous segment is large functioning actively or is infected. In this patient the ureterectomy alone was warranted because of the risk of a heminephrectomy to the only remaining renal tissue.

JOHN A. LOXLEY, M.D.

Everidge, J., and Barnes, D. R.: Gunshot Wounds of the Ureter: 3 Cases, with Preservation of the Kidney in 2. *Bull J Urol* 1946 18 166

The authors have presented in detail 3 personal cases of trauma to the ureter sustained in warfare. They state that few cases of war trauma of the ureter have been recorded, probably because of the high mortality resulting from concomitant or associated injuries.

Clinically cases of ureteral injury present hematuria, either evidence of a urinary fistula which tends to appear in a week after the injury is sustained, or symptoms and signs of retroperitoneal abscess of a low grade infection. There is no significant early diagnostic picture of ureteral trauma. The early case could only be diagnosed by obstruction to the passage of a ureteral catheter or by surgical exploration. Excretory urography is equivocal and seldom justifies an immediate exploration.

ROBERT TURELL, M.D.

Davis, D. M.: Intubated Ureterotomy. *J Urol* Balt., 1947 57 233

A series of cases is presented in which ureteropelvic obstruction with resulting hydronephrosis was relieved by a procedure which the author terms intubated ureterotomy. The ureter was split longitudinally throughout the length of its narrowed portion and intubated with a gall bladder T tube (Fig 1). The narrow ribbon of ureter was held close to the T tube by a few sutures of 000 plain catgut. The T tube remained in place for approximately 4 weeks following the operation, in the main case cited and was then removed.

The author states that in no case in which this procedure was employed has there been a true failure. Symptoms have been relieved in every case. A residual urinary infection was present in 3 cases and subsided spontaneously in 3 years in 1 of the cases. All of the other cases were symptom free and showed sterile urine. The patient who has been followed up for the longest period of time shows a normal urinary

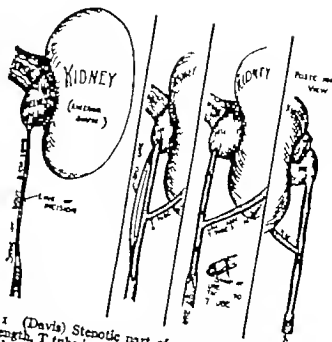


Fig 1 (Davis) Stenotic part of ureter incised for its entire length, T tube inserted, ureteral ribbon held in contact with T tube by a few sutures of fine plain catgut.

tract on the operative side 4 years and 3 months following surgery
CLARENCE V. HODGERS, M.D.

BLADDER, URETHRA, AND PENIS

Frather, G. C.: Spinal Cord Injuries: Care of the Bladder. *J Urol*, Balt., 1947 57 15

The author believes that the sequence of events in reference to the bladder following serious trauma to the spinal cord may be divided into three stages. The first is that of an atonic, neurogenic bladder. Cystometric studies at this time reveal a large capacity low pressure and no evidence of a reflex detrusor action. The second stage is that of an autonomic neurogenic bladder with periodic overflow incontinence. There is higher intravesical pressure and reflex contractions occur but are not sufficient to empty the organ. The third stage is characterized by micturition in patients with voluntary incontinence. It is characterized by complete transection of the bladder with an autonomic bladder with periodic involuntary emptying.

The author observed 130 patients with cord bladder who were treated during military service under the following regimen: drainage was provided by either a suprapubic tube or a urethral catheter and a closed system of drainage and irrigation was provided. Routine intravenous urograms were done and routine cystometric studies were deemed essential to determine the stage of bladder recovery and indicate when to institute voiding trials. When the patient's general condition was satisfactory and cystometric studies indicated the likelihood of successful voiding, the suprapubic tube was removed, a urethral catheter was inserted and the sinus allowed to close. Voiding trials were then instituted under close observation. Following this regimen in 21 cases of

mass extending upward from the upper pole of the epididymis, seemingly originating from either the cord or the epididymis. The tumor is characterized as a stony hard freely movable multilocular mass which may suggest a calcified varicocele and roentgen ray studies may confirm the presence of intra-tumor opacities.

Treatment indicated is operative exploration. Extratesticular masses may be benign in which case epididymectomy and excision of the tumor is indicated. In suspicious cases orchectomy should follow only the determination of neoplasia upon frozen section.

Grossly the tumor is a multiple fibroma and the characteristic microscopic picture is that of whorls of fibrous tissue with a few typical spheruloid vessel wall thickening with some areas of hyalinization and often calcification. The typical findings of chronic inflammation are routine. The tumors are referred to as multiple fibromata of the tunica vaginalis.

ROBERT LUCE, JR., M.D.

Kelby G. M., and Stenstrom, K. W. The Treatment of Malignant Tumors of the Testis. Review of 100 Cases. *Radiology* 1947 48 1

A study of 100 testicular tumors treated at the University of Minnesota Hospitals, Minneapolis from 1936 to 1934 is reported. Thirty four were not classified as to type 37 were seminomas and 29 were carcinomatous mixed tumors according to E. T.

TABLE I—THIRTY SEVEN CASES OF PROVED SEMINOMA OF THE TESTIS

Year	No. of cases	Years of survival								
			3	4	5	6	7	8	9	
1930	2									
31										
32										1
33	6	6	4	5	5	3	5	3		
34										
35										
36										
37										
38										
39	5	4	4	4	4					
40	5									
41										
42	6	5								
43	6									
No. cases	57	3	5	24		6	4	5	10	8
N. living		5	7	5	5	0	2	2	4	4
Per cent		8	68	6	69	56				

Metastases were present in 63 per cent of the cases at the start of irradiation treatment.

TABLE II—TWENTY NINE CASES OF PROVED CARCINOMATOUS MIXED TUMORS OF THE TESTIS

Year	No. of cases	Years of survival					
		1		3	4	5	6
1926	1	1		0			
1927			0				0
28		0		0			
1929			0				
30	0						
1931	0						
32	3		1				0
33		1		0		0	
1934	1	0					
35							0
36		1		0		0	
37	3	2	3	1			1
1938	2		0				
1939	1	1					
40		1					
41	3						
42							
1943							
No. cases	20	17	15	11	20	19	6
No. living			3	1			
Per cent		4	20	5			

Metastases were present in 86 per cent of the cases at the start of irradiation treatment.

Bell's classification. The average age of the patients with seminoma was 37.6 years and of those with carcinomatous mixed tumor 39.4 years. A history of trauma was obtained in 15 per cent of the cases. Cryptorchidism was present in 8 patients and hydrocele in 6.

The treatment consisted of simple orchectomy followed by irradiation immediately whenever possible. However, the average time interval between operation and irradiation was 3.5 months. Cases without demonstrable metastases received about 3,000 r in air in fractionated doses to an anterior and posterior abdominal portal each over a period of 3 weeks. If a large abdominal mass was present intense treatment was at first directed to it. Other areas were irradiated thereafter if a local response had occurred. Six advanced cases were irradiated only, whereas 4 cases were subjected to Hinman's dissection (a more radical operation) which was followed by radiation treatment.

The results are shown in Tables I, II, and III.

The authors arrived at the following conclusions:
1. Tumor of the testis is frequently found in patients with hydrocele.

is particularly prone to occur if the capsular ligament is cut and subsequently sutured. In a dissection of several cadavers the author discovered a thick ligamentous structure which is the capsular ligament of the distal radioulnar joint lying just under the tendon of the extensor digiti quinti proprii. The capsular ligament of the distal radioulnar joint is tightest on the dorsal aspect during pronation, and is tightest on the volar surface in supination. From this it was concluded that it was advisable to immobilize the forearm in a plaster of Paris bandage in the neutral position, which is the position in which the ligament is relaxed.

These conclusions were based on the study of a 26 year old white female who sustained an injury to the left wrist when she struck her limb on the edge of a machine in a hat factory. Subsequently a mass developed on the dorsal and inner aspects of the left wrist. An x ray film was taken and it was reported to be negative. The swelling was diagnosed as a double ganglion and it was excised under general anesthesia. A plaster of Paris cast was applied for a period of 2 weeks.

Examination some 6 months later indicated that the patient had a pronation contracture of the forearm and that active supination was impossible. A dimpling of the skin at a point corresponding to the dorsum of the distal radioulnar joint was noted when supination was forced with the patient under anesthesia. This band could be palpated. By forceful manipulation an audible snap was heard and the contracting band disappeared. However complete supination could not be obtained until a scalpel had been introduced between the ulna and the skin at the site of the scar and the band had been divided. Months after the operation there was still about 20 per cent loss in active supination.

C. FRED GORRINGER, M.D.

Allen, I. M.: Atrophy of the Outer or Radial Side of the Thenar Eminence; A Benign Disorder. *N Zealand M J* 1946 45 549.

The author presents a series of cases of benign atrophy of the radial portion of the thenar eminence. In every case there was a partial, sometimes sharply defined atrophy of the radial portion of the thenar eminence. In many cases the muscles of that part had diminished to such a degree that the radial edge of the first metacarpal bone, especially at its base, was visible and easily palpable. From inspection and palpation the impression was that the muscles involved were the abductor pollicis brevis and the opponens brevis.

In a study of the nerve supply to these muscles Saunders found that the branches of the median nerve ran a highly recurrent course from its origin beneath the transverse carpal ligament. In some cases, separate branches ran to the abductor pollicis and to the opponens pollicis. In other cases the nerve occupied (for part of its course) an unprotected position just beneath the skin, where it was exposed to trauma which is possibly an important factor in

the production of the syndrome. Other cases of atrophy, without a history of injury, may be explained by the possibility of a frank polyneuritis. In some cases there is evidence to show that the affected portion of the thenar eminence and its nerve supply may be prone to a developmental defect.

The author made a study of the essential features of 11 of the 23 cases which he investigated.

C. FRED GORRINGER, M.D.

Gurl, J. P.: The Formation and Significance of Vertebral Ankylosis in Tuberculous Spines. *J Bone Surg* 1947 29 136.

Tuberculosis of the spine cannot be said to be healed until there is a fusion of the affected bodies. When ankylosis has occurred recurrence of the disease and increase in the deformity are not observed. The most rapid formation of vertebral ankyloses occurs in cases with circumscribed foci localized near the margin of the vertebral bodies (average time 1 1/2 years after onset of the symptoms). Cases presenting destruction in the paravertebral areas ankylosed in 3 or 4 years. In cases characterized by progressive thinning of the intervertebral space fibrous union was obtained in 4 or 5 years.

The formation of a vertebral block composed of two or more vertebral bodies is influenced in speed and type of formation by the segment of spine involved (cervical, thoracic, lumbar).

When the disease process involves the center of the vertebral bodies loss of the intervertebral joint space occurs rapidly.

Spinal fusion prior to formation of a sound vertebral block of the anterior spine does not prevent further deformity or spread of the disease.

Body ankylosis may not be obtained in children even after very prolonged periods of treatment with or without a spinal fusion.

VERNON C. TURNER, M.D.

SURGERY OF THE BONES JOINTS, MUSCLES, TENDONS, ETC.

Kelly, R. P.: Skin Grafting in the Treatment of Osteomyelitic War Wounds. *J Bone Surg* 1946 28 681.

In some war wounds loss of both bone and soft tissue is so extensive as to preclude secondary closure, and some other means must be sought for inducing prompt healing. Free skin grafts will often effect healing in such wounds. There is little basic difference between closure by skin grafts, either free or pedicled, and secondary or primary closure.

Saucrization is a procedure which involves removal of all dead or devitalized tissue, and the contour of the wound is so arranged that application of appropriate pressure to a skin graft will be possible.

Usually a free graft is applied to the saucerized wound as a temporary measure. It is best done about 4 days after saucerization, but grafts may be applied at the time of this operation or as long as 6 weeks later. The receptiveness of the bed for grafts

and subsequent joint function was impaired beyond what would have been expected from the wound damage. In some cases in which the bone and joint damage was not extensive, there was lingering sepsis and slow joint destruction. In cases in which there was extensive bone and cartilage destruction by the original trauma, severe septic arthritis was the rule. Fortunately only a few amputations were necessary but the joints were permanently destroyed.

The program which was laid down in 1944 for the management of all knee joint wounds, penetrating or perforating, regardless of the time which had elapsed since the wound was received, was as follows:

In the forward area, after preparation by transfusion of blood or plasma, the joint was thoroughly opened, and foreign bodies and other material were removed. Loose bone chips, loose cartilage, and damaged menisci were excised. Defects in condyles were trimmed evenly and comminuted patellae were usually removed. The joint cavity was thoroughly irrigated. The synovial membrane, and at times the capsule, was closed, and 10,000 to 20,000 units of penicillin were instilled into the joint. When insufficient soft tissue remained to close the joint, a skin or fascia flap was mobilized to cover the defect. If damage was so extensive that closure could not be achieved, and the joint was considered hopeless, excision of the remaining joint cartilage was advisable. Immobilization was accomplished by a single hip spica or a Tobruk splint. Systemic penicillin was continued. From 24 to 48 hours following the surgery the joint was aspirated and irrigated, and filled with penicillin by means of a large needle.

In the base hospital, 4 to 6 days after the wound had been received, reparative surgery was done. The joint was again aspirated, irrigated, and filled with penicillin, and the remaining open wound was closed. If doubt existed as to the proper treatment in the forward area, the joint was reopened and examined.

In 10 to 14 days after the wound had been sutured, immobilization was discontinued and active motion begun, with the limb in balanced suspension in a Thomas splint with the Pearson attachment. Signs of sepsis within the joint were treated either by reoperation with thorough cleansing of the dead tissue and blood clots, or were repeatedly aspirated, irrigated, and filled with penicillin.

If hope of a functioning joint had to be abandoned, radical resection of the joint was preferable to open drainage.

Hampton presents data from several series of cases to show the marked improvement in results when this program was followed. In one large series the incidence of sepsis dropped from 7.4 to 5.1 per cent. Eight very interesting and convincing cases are presented in detail, with roentgenograms and photographs.

Among the conclusions drawn by the author is the decision that continuous drainage of fluid from the knee joints is not adequate surgical treatment in cases of suppurative arthritis and is not indicated. He believes that knee-joint resection has a definite place

in the management of severe wounds and sepsis in military surgery
NEWTON C. MIKIN, M.D.

Ottolenghi, C. E. and Del Sol, J. M.: Anterior Arthrodesis of the Instep (*La artrodesis anterior de la gárganta del pie*). *Rev. A. med. argent.*, 945, 60-630.

Anterior arthrodesis of the instep is a simple procedure and when done with the correct technique, satisfactory results are assured.

The author reports 53 such operations. The indications included (1) alteration of form because of deformity from traumatic, infectious gonorrheal, or tuberculous arthritis, or fractures of the malleolus, astragalus, or the leg. (2) alteration of function because of central or peripheral paralysis, such as from poliomyelitis, or from paralysis of the sciatic nerve or some of its branches.

The arrangement of the graft is either intra-articular para-articular or extra-articular for slipping, with or without resection of the articular surface or for inversion.

STEPHEN A. ZIEGLER, M.D.

Gul, L.: Disarticulation of the Transmetatarsal Joint of the Lisfranc Type (*La disarticulación transmetatarsiana de Lisfranc*). *Chir. org. modica*, 946 30-2.

The author reports 373 disarticulations of the transmetatarsal joint in a total of 300 patients which were done in a period of 31 months, from April 1941 to January 1944.

The Lisfranc amputation has fallen into some disrepute in the past because of the fact that the muscle balance was disturbed, the patient no longer walked well, and before long he developed pressure sores where abnormal weight bearing occurred.

The technique used in the 373 cases was a modification of the Lisfranc operation perfected by Scaglietti. This modification consisted of transplanting the tibialis anterior tendon and the extensor hallucis longus tendon into the center of the disarticulation so that a movement of extension could be made and any movement of supination of the foot could be prevented, and a slight amount of pronation of the foot would be produced so that the whole plantar surface of the extremity would come in contact with the ground on weight bearing.

The large number of cases were the result primarily of frostbite during mountainous warfare. The operative procedure recommended by the author is the removal of the cartilaginous portion of the distal tarsal bones and then smoothing down the bones well by the use of a file so that there are no rough protruding spicules of bone. Then the tibialis anticus and the extensor hallucis longus tendon are firmly sutured between the second and third cuneiform bone with the tendon of the peroneus longus. This gives a good stable attachment and the foot can be brought into direct contact with the ground in walking. The inability to do this has been the one great criticism of the Lisfranc operation in the past. The plantar skin and subcutaneous tissues are utilized so

that no weight is placed on the thin dorsal skin and subcutaneous tissues. The suture line is always made on the dorsal surface of the foot.

Postoperatively the author recommends the insertion of a drain for a short period of time and the immobilization of the extremity in a plaster cast which extends from the middle third of the thigh down to the tip of the foot with the knee bent to 25 degrees and the foot at a right angle with a slight amount of pronation.

In this series of cases there was 1 death from a pulmonary embolus. In 5 patients with postoperative hemorrhage another operation with ligation of the bleeding vessels was necessary.

CARLO SCUDERI, M.D.

FRACTURES AND DISLOCATIONS

Sulzer, P. and Thobols, P.: The Treatment of Fractures of the Clavicle by Internal Splinting with Kirschner Wire (Sur l'embrochage par broche de Kirschner dans le traitement des fractures de la clavicule). *Lyon chir.*, 1946 41: 552

There are numerous methods used for the repair of fractures of the clavicle with displacement but none is entirely satisfactory. All of them make daily inspection of the position of the fragments and of the condition of the apparatus necessary. This is difficult in a hospital and nearly impossible in private practice. It is hard to immobilize the shoulder and sternoclavicular joints and there is danger of compression of the nerves and vessels in the axilla. None of the appliances thus far devised are comfortable nor do they preserve reduction of the fragments of the clavicle.

Internal splinting makes all of these considerations unnecessary. It maintains reduction by giving the bone its natural curve. This is also true in multiple fractures of the clavicle. The wire is firmly anchored in the principal fragments.

This procedure is based on the work of Kuntschner in the intramedullary nailing of long bones. However, the conditions encountered in pinning of the clavicle are somewhat different from those encountered in nailing of the bones of the extremities. The clavicle is cancellous on the medial and lateral ends therefore the pinning is intramedullary only in the midportion of the bone. The location of the skin incision also presents a problem different from that in nailing of the bones of the arms and legs. Goddard does not use any incision at all. Rocher states that manual external reduction is unsatisfactory and that an incision is necessary. Sicaud uses an incision only in multiple fractures of the clavicle. Pinning of the clavicle under constant x ray control so easily done in the extremities, is impossible because the clavicle cannot be viewed from various angles by means of x rays. This is one important reason why an incision is necessary. Fractures of the clavicle are often badly displaced, and reduction by external means alone is very difficult. Even in the absence of severe displacement, reduction of fractures of the lateral

portion of the clavicle by using the arm as a lever is impossible because of the conoid and trapezoid ligaments. Often the roentgenogram fails to reveal all the fragments in a severely comminuted fracture. Manipulation often causes the skin over the clavicle to be pierced by one of the sharp obscure fragments.

It is also important to protect the underlying large vessels and nerves and much safer to make an incision and discard all esthetic objections.

The technique of pinning has to be adjusted to the site of the fracture. Rocher inserts the Kirschner wire through a prepared opening at the medial end of the clavicle. The clavicle has the shape of an S. It seems to be very difficult to predetermine the direction of the opening at the medial end of the clavicle for every type of fracture of the clavicle. If the opening is incorrect the wire abuts against the inner wall of the cortex and does not enter the lateral fragment. Also the wire may slide along the inner wall of the cortex and impact against the outer fragment.

Insertion of the wire through the dorsal aspect of the clavicle seems to be the best method. The Kirschner wire inserted through a small skin incision should enter the outer fragment in cases of fracture of the medial third and in certain fractures of the middle third of the clavicle. It should enter the medial fragment in fractures of the outer third and in most fractures of the middle third.

Descriptions and diagrams are presented to illustrate a few technical details in 3 typical fractures of the clavicle.

The patient is generally allowed to move his shoulder and elbow on the next day. The wire is removed on the twenty fifth day.

The author states that he found that fractures of the clavicle treated with internal fixation heal more slowly than those treated by manipulation and external immobilization. No explanation of this observation is offered. It is suggested that the play which the fragments have around the wire or the presence of a foreign body may be responsible for the slow union.

GEORGE I. REISS, M.D.

Hauser, E. D. W.: Special Techniques for Unusual Fractures of the Forearm. *Q. Bull. Northwest. Univ. M. School* 1947 21: 18

The author presents a number of cases of difficult fractures of the forearm illustrating the principles of treatment with varied techniques.

In compound fractures, in addition to the usual methods employed in cleansing the skin and the wound itself, he used emulso, a cationic detergent, to cleanse the skin, and repeatedly washed the wound with a 1:3,000 aqueous solution of zephiran chloride.

When malunion could be corrected by osteotomy he used drill openings connected with an osteotome until the bone could be bent. In other words the result was similar to that when the brushes of two brooms interlock.

The author's fourth case presents an interesting problem. The patient was an 8 year old child who

had a marked ulnar deviation of the hand, caused by cessation or at least, a slowing down of growth at the distal ulnar epiphysis following the application of radium to a strawberry nevus at the wrist at the age of a year. The distal ulna, including the cartilaginous epiphysis which contains two centers of ossification, was split longitudinally and a tibial graft was wedged in place in the cleft. Union occurred and led to correction of the ulnar deviation of the hand.

The author prefers external fixation of compound fractures when possible, but was forced to use plates at times.

VANNOY C. TUCKER, M.D.

Howorth, M. B.: Congenital Dislocation of the Hip. *Ann. Surg.* 947 125 216.

The cause of congenital dislocation of the hip is still vague. Both the anatomical and embryological explanations have been few and far between. The authors have made an extensive study on 15 normal fetuses of which the ages ranged from 10 weeks to full term. Dissections, roentgenograms and serial sections were made to make a comparative analysis of the embryological anatomy of the fetuses 10 weeks, 3, 4, 5 and 6 months old, respectively. The lengths of the femurs varied between 3 and 8 cm.

The youngest femoral specimen (10 weeks old) measured 3 cm. The muscles and tendons of the hip and thigh were not differentiated from each other. Rather than an individual muscle, one observed a pale homogeneous mass. However the gross appearance of the capsule, and the femoral and acetabular articulation was comparable to that of a fully developed fetus or adult hip. The femoral head and acetabulum measured 5 mm. in diameter and were covered by cartilage. The capsular apparatus was well developed and provided firm stability to the hip joint. The angle between the neck and shaft of the femur averaged 140 degrees.

All of the hips in fetuses 3 months old or older disclosed a similar developmental pattern. Muscles differentiated from each other blood vessels and nerves were discernible, and there was a normal cartilaginous lip along the posterosuperior half of the margin of the acetabulum. With the exception of limited 145 degree motion in extension, the function of the thigh approached normal values.

In another group of hips (8) studied by the author the only variations worthy of note were that (1) the tendons could be distinguished from their muscles, (2) the thigh extension was limited to 160 degrees, (3) the labrum glenoidale was well developed, and (4) the habenarian gland was well developed.

Despite the splendid research work done by the author no appreciable advance in our knowledge concerning congenital dislocation of the hip has emanated from this study. For instance, nothing has been learned relative to its great preponderance in the female. Workers at the Rockefeller Institute are alleged to have observed congenital dislocation in rabbits it is hereditary in this species and can be inbred.

The author's study is based on 385 cases of congenital hips. His findings were as follows

In all but a few cases the femoral head was dislocated outward, upward and forward, with the capsule and rectus tendon greatly elongated the capsular apparatus was thickened. Contrary to the text book dicta, the capsule was not always hourglass in shape. There was uniform limited adduction, due mostly to contraction of the adductor muscle. The posterior dislocation of the hip was limited to the older group of patients. Because of muscle contraction (anterolateral group) with adherence of the capsule to the ilium and flattening of the anterior acetabular hip margin, much resistance was offered in telescoping the hip from the ilium. The gracilis and adductor longus were the principal offenders. The remaining adductors and the hamstring group of muscles rarely participated in the immobility of the congenital hip. The acetabulum was not only shallow but was generally occupied by the habenarian gland, which in the majority of cases would prevent reposition of the femoral head unless the surgeon gouged out the copious acetabular debris. It was further noted that the habenarian gland often replaced the acetabular cartilage as a fibrous obliterated mass. The ligamentum teres was elongated, hypertrophied, frayed, or absent.

In half the cases the acetabulum was not deep enough to accommodate the femoral head. In a smaller percentage of cases, the head was much greater than the acetabulum. Some of the heads were flattened medially which precluded adequate reduction without surgical interference.

Closed reduction is the treatment of choice in infants under a year of age. The traumatizing procedure of Lorenz should be abandoned. The Hibbs procedure, according to the author is far more advantageous. Immobilization to 90 degrees of flexion and adduction is recommended for from 3 to 6 months. Walking is permitted 2 months after the completion of reduction.

Preliminary skeletal traction combined with tenotomy of the gracilis and the adductor longus is far superior to the brutal tearing of such muscles in the older group of children. Open reduction, in capable hands, is the treatment of choice in the older group.

The author prefers a Smith-Petersen type of incision. The capsule is incised anteriorly, but cutting it superiorly is avoided. The hypertrophied habenarian gland and fibrous tissue is gouged out from the acetabulum. Any adhesions between the capsule and ilium are released. Correction of the antversion is sometimes indicated. It can be obtained by supracondylar transverse osteotomy. Immobilization in a plaster of Paris cast for 6 weeks is recommended, care being taken not to precipitate a coxa plana.

Shell stabilization is reserved for children over 10 years of age or older. The procedure advocated is the Gill method, which has been extremely efficacious in the irreducible congenital dislocations. Here, too, preliminary traction is of paramount importance.

Cup arthroplasty is indicated for bilateral hip arthropathies and fusion may be performed in the unilateral and painful arthropathies.

SAMUEL L. GOVERALE, M.D.

Bosworth, D. M.: Fracture Dislocation of the Ankle with Fixed Displacement of the Fibula Behind the Tibia. *J. Bone Surg.* 1947 29 130.

Attention is called to a condition fracture dislocation of the ankle joint which probably has escaped recognition by most surgeons. Five cases are presented in which a posterior displacement of the proximal fragment of the fibula behind the tibia prevented accurate closed reduction. Open reduction requires the use of a pry pin between the tibia and fibula and the use of considerable force to snap the fibula back into normal position. Following this anatomical reduction of the ankle has been easy pulled back behind the tibia by the intact fibula is ligaments. Continuation of the force rotating the talus backward and out from its position beneath the tibia causes further force on the collateral ligaments and, finally, the fibula is broken off against the posterior tibial border. With this fracture there is nothing left attached to the upper fragment with which it can be pulled back into place.

Most ankle fractures do not have a posterior displacement of the fibular shaft because the malleolus is broken by pressure against the lateral surface of the tibia.

The diagnosis of posterior fixation of the fibula by means of roentgenograms may be missed since one may believe that the view taken is not truly lateral. In a true lateral view the fibula does not lie posteriorly but is superimposed on the center of the tibia.

UNKNOWN C. TURNER, M.D.

Magee, R. K.: The Kuntscher Method of Pin Fixation. *Canad. M. Ass. J.* 1947 56 65

The Kuntscher method of pin fixation was popularized by its use at the Kiel German Naval Hospital and was first reported in March 1940.

The author studied 20 cases in which this method was used, at the Clinic of Professor J. F. Nuboer in Utrecht, Netherlands. The principle is the same as that of the Smith-Petersen pin fixation for femoral neck fractures, i.e. axial intramedullary fixation, by large cannulated stainless steel rods of fractures of shafts of the long bones. The pins range from 7 to 11 millimeters in diameter and vary in length. The width of the medullary canal is measured by means of a roentgenogram of the bone taken at a distance of one meter from the x-ray tube. The next smaller pin is used so that it can be inserted more readily and yet held firmly. The longitudinal fluting prevents rotation. Pins for femurs are straight, those for tibiae are slightly curved and have split flared lower ends to engage in the wide lower tibial medulla. Pins and other instruments are illustrated, as well as a patient prepared side lying on a Hawley table.

The ideal case for this procedure is a transverse fracture of the mid-shaft or of the upper one third of the femur or the upper half of the tibia. The technique of a femoral pin insertion by the closed and open method is described in detail. Closed reduction is carried out under strict fluoroscopic control. Epi-

dural block anesthesia is preferred in Professor N. N. boer's Clinic. There was no shock at all in the cases observed. No external fixation was used for femurs. Active motion of the knee and of the hip is encouraged in 2 or 3 days after surgery. Patients with transverse fractures are up on crutches in 2 to 3 weeks, and patients with other types of fracture are up when x-rays show adequate callus.

Unusually large fusiform callus is often demonstrable in roentgenogram, in 2 to 3 weeks. Whether impaction or the extrusion of marrow substance into the fracture site is responsible for this response is not known. Pins are removed in from 3 to 4 months, or later in cases of pseudarthrosis.

The tibial pin is inserted through an oblique window in the upper inner cortex and the pins flare on the lower end to hold in the widened distal medullary canal. A plaster cast from groin to toes is used to prevent rotation. The method has been used for fractures of the humerus, ulna and radius.

Several cases are presented with roentgenograms. All patients were young adults in whom rapid solid union was obtained. The first case in America in which the Kuntscher method was used is described.

Even in open reduction there is little disturbance of the soft tissues, as periosteal stripping is avoided. Infection is not likely if compound fractures are not included as in the group studied, the procedure was carried out without the protection of penicillin. Occasionally a pin may break or a ring sequester may develop. The exposure to radiation of the assistant who reduces the fracture under fluoroscopic control is a hazard. The technique is detailed and demands facilities and teamwork available only in a fracture center but has advantages over other methods in upper femoral fractures.

FRANCIS E. BREDENECKE, M.D.

ORTHOPEDICS IN GENERAL

Zawisch, G.: Marble Bone Disease; A Study of Osteogenesis. *Arch. Path. Clin.* 1947 43 55

Marble bone disease is commonly known as Albers-Schoenberg disease osteopetrosis, or osteosclerosis fragilis generalisata. The disease is due to the influence of an unknown agent which damages the bone forming blastema at the beginning of the second period of development of each bone. From this time on the differentiation of bone tissue is retarded and the less differentiated types become hyperblastic. The malformation is responsible for the general retardation of resorption because the two phases of the bone forming process—deposition and resorption—stimulate each other.

The basis for the author's study was an infant, 11 months old. Detailed description of the microscopic findings is given which outlines the findings in the various periods of bone growth. From this it was concluded that in marble bone disease the threshold of response to stimuli which bring about resorption is raised. Resorption is arrested at the beginning of the second period for a long time. The results are the

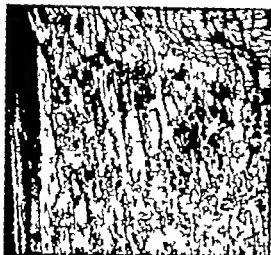


Fig. 2 (Zawisch) Marble bone rib, part of a longitudinal section. Note the epiphyseal line and the densely packed spongiosa. To the left, cortex and periosteum. Azan-Mallory stain, X350.

fetal size and shape of the marrow cavity a thick cortex composed of all the embryonic strata which normally are removed, and an unusual amount of spongiosa. In the finer histologic structures it was found that the osteoblasts everywhere were so flat that they were hardly distinguishable.

Despite conflicting statements in the literature it was the feeling of the author that osteoclasts are present in all stages of their evolution. The absorption front of the cartilage is normal, but the succeeding endochondral ossification is pathological from the beginning. Normally the first period stage, in which no endochondral bone is formed, is being repeated as long as the bone grows. The capillaries which absorb the cartilage always keep ahead of the osteoblasts, and deposition of bone begins at a certain distance from the absorption front. Thus, the capillaries have time to absorb a certain amount of cartilaginous ground substance. As soon as a cartilage cell is liberated by the absorption of its walls, basophilic matter and an osseous globule are deposited in the cavity.

Endosteal ossification in marble bone disease shows the same pathologic development as cortical ossification. A hyperplastic production of less differentiated bone tissue, containing more basophilic matter than usual, is at the root of the evil.

There is no doubt that many patients with marble bone disease show recessive heredity but others do not.

Clubbing of the ends of long bones is the result of the hyperplasia and persistence of less differentiated types of bone tissue in the metaphyses. These metaphyses which grow most rapidly are more readily affected. Histochemical methods have not been used up to now and the general ash contents have not been analyzed except by Clifton, Frank, and Freeman, who made use of a biopsy fragment for this

purpose. They showed that the spongiosa has a higher ash content than the cortex. Those types of tissue e.g., chondroid bone and the basophilic inclusions, which even normally do not contain fibrils, are hyperplastic in marble bones and this increases the absolute amount of calcium. The spongiosa is richer in basophilic inclusions than the compacta. The greater density of marble bones in the roentgenogram is due partly to a greater density of structure when the bones are in a state of repair (eburnation) and partly to a higher calcium content, revealed indirectly by the scarcity of fibrils in all the types of bone tissue involved.

Polarized light reveals a relative scarcity of fibrils in all the bone tissues. Chondroid bone of the type which is hyperplastic in marble bone does not contain fibrils even normally and the pathologic change in the ground substance consists merely in an increase of basophilic. In the other bone tissues the scarcity of fibrils is very conspicuous. The anemia in marble bone disease may be due to the same agent which impairs the differentiation of bone tissue.

C. FRED GORMAN, M.D.

Copeman, W. S. C. and Ackerman, W. L.: Edema or Herniations of Fat Lobules as a Cause of Lumbar and Gluteal "Fibrositis." *Arch. Int. Med.* 1947 79 22.

Edema, herniation, and strangulation of fat lobules are postulated by the authors as the true cause of fibrositis, or painful back. Biopsy material has not substantiated any pathologic evidence that fibrositis exists *per se*. On the other hand, each of the 11 cases presented exhibited fibrofatty deposits at the painful point and extirpation resulted in an apparent cure of the syndrome.

The authors' classification of the herniated fatty tumors is as follows: (1) pedunculated, (2) non-pedunculated, and (3) the foraminal type. The last develops from one of the three segmental lumbar nerves or vessels. All tumoractions can become severely compressed or contused (by trauma) between the deep and superficial lumbosacral and gluteal fascia. Demonstrable hyperemia coupled with edema of the excised tumor has convinced the authors that they are dealing with a definite clinical entity which in their experience, when subjected to surgery, was permanently cured.

Furthermore, it is to be remembered that whereas these tumors have been treated heretofore by novocaine injection, the cure has been questionable. It is true that the fat tumor is accompanied by nerve trunk, injections will not relieve the pressure.

Interestingly enough, the surgical approach is performed under local block. Digital pressure is exerted on the herniated fat tumor until the patient involuntarily winces (trigger point pain). The offending mass is not removed alone, but all surrounding fat disintegrated by destruction of its septae.

In the brief period of postoperative observation it was noted that no recurrences had appeared in any of the 11 cases.

The authors have also studied and dissected 24
ordervers
SAMUEL L. GOVERNALL, M.D.

Kessler H. H.: Rehabilitation of the Arm Ampu-
tee. *Plast Reconstr Surg* 1947 3 1

During the 4 years of World War II 17 000 service men lost their limbs as a result of war wounds and operative injuries. During the same period 150,000 civilians lost their limbs from accidental injuries and disease. Of both groups approximately a third were arm amputees.

There are two primary requirements that a prosthesis must fulfill if it is to meet the needs of an arm amputee: that of dress and that of utility for the routine pursuits of life. To date there has been no one prosthetic device that satisfies these requirements. The functions of the upper extremity are so intricate and complex that they cannot be duplicated; they can only be imitated. Furthermore the one function that the amputee misses above all else is tactile sensation.

In a survey of 9,000 arm amputees in Germany 60 per cent preferred the arm prosthesis for dress alone. Made of wood, leather, plastic, latex, or felt, it can be made comparatively light, and in some cases even sufficiently artistic to duplicate the natural appearance of the normal hand.

It is impossible to duplicate the combinations of hand and finger function. However, there are four simple functions which are important and can be duplicated mechanically. They are forceps action, pliers action, ring action and hook action. These functions can be obtained by the standard type of utility hook which is held closed by a heavy rubber band and opened by the action of a loop around the opposite shoulder which pulls on a lanyard attached to an outrigger on the hook. Closure of the hook is accomplished by the simple release of the pull on the lanyard, the hook closing by the action of the elastic band. While the amputee can exercise considerable ability in the handling of routine tasks, the hook does not hold soft objects such as a cigarette or a doughnut, satisfactorily.

In the cineplastic procedure the muscles that remain in the stump are canalized and attached to a system of levers so that the flexors and extensors in the forearm and the biceps and triceps in the upper arm activate the artificial hand and arm. The great advantage of this method is the natural and physiological action, the simplicity of the mechanical device, the effortless control and the avoidance of straps, loops and harness to the opposite shoulder for below the elbow arms. However the principle had its limitations in application to the needs of factory workers, farmers and laborers who required a prosthesis that could exercise considerable force.

The scope of cineplasty can now be extended to more varied and energetic physical demands through the development of a utility hook operated by cineplastic motors and interchangeable with a cineplastic hand. This has been accomplished by the development of an ingenious spring coupling which permits



Fig. 1 (Kessler) Cineplastic prosthesis for upper arm amputee.

interchangeable action of the band and hook by the cineplastic motors.

In addition to cineplasty other special methods are available to the amputee to meet his special needs. The Krukenberg operation is one of these methods. It consists of the splitting of the forearm into two fingers so that the approximation of the two digits provides prehension while the natural skin innervation permits normal tactile sensation. The method has been very popular in Germany and Russia. In the United States where public prejudice exists toward the appearance of the stump there has been a natural reluctance to undertake this measure. It is a valuable procedure for the bilateral amputee since he requires no prosthesis. It is of especial value for the blind bilateral arm amputee.

In the rehabilitation of the arm amputee a five point program is required: the psychological preparation of the patient, the selection of adequate surgical methods which will give him a painless and satisfactory stump, the aftercare of the stump, the selection of the device or special surgical procedure which will permit him to wear a prosthesis and finally the training of the amputee in the use of the prosthesis.

C. FRED GOVERNALL, M.D.

Mislove, R. K.: Sauerbruch Cineplastic Amputation.
Lancet Lond., 1946 2 904.

The author indicates that the cineplastic amputation as developed by Sauerbruch appears to have the advantage of permitting more dexterous movements under more normal muscle control than the usual prosthesis. Amputees at Sauerbruch's clinic demonstrated that they could write with normal legibility and could pick up a map with forceps or with the hand, pick out a cigarette and light it, and attend to their clothes. This type of amputation is applicable only to the upper limb and is best chosen for bilateral cases. The shortest stump in the forearm in which it may be used is 7 or 8 cm.

from the anterior elbow crease. There must be a movable scar at the end of the bones, in as much as the degree of up and down movement of the ivory pins determines the extent of opening and closing of the hand that will result. The pin is passed through a skin lined tunnel and it is connected by a chain to a bar from the lower end of which a metal rod goes to the hand mechanism. One side of the mechanism is the thumb and the other the index finger and the remainder of the hand. In instances in which the terminal scar is fixed reamputation must be performed. The bones are divided 3 cm. shorter than the muscles and the deep fascia but not the muscles is sutured over the end of the bones to give a free scar. From 5 to 10 days later active exercises and massage are instituted. Constant practice is a requisite.

The tunnels are made under local anesthesia so that the best muscle groups may be selected for the tunnel.

An area of about 3 finger breadths, or about 5 by 5 sq. cm. is mapped out about 5 cm. from the end of the stump. Three sides of this square are freed to form a flap with its base either on the medial or on the lateral side. The flap consists of skin and subcutaneous tissue including the deep fascia, folded into a tube with the skin surface on the inside.

A blunt pointed muscle dilator is passed through the muscle fibers along a tract about 1 cm. deep only a thin layer of muscle fibers being picked up

The tube of skin is then passed through this tunnel in the muscle and is fixed with three sutures to the skin edge of the side opposite the base of the tube. A Thiersch skin graft is cut and sutured in place over the remaining raw area.

The first dressing is done in 10 days. Then the pins, from 5 to 10 cm. in diameter are inserted. Exercises are maintained and in about 3 months an artificial limb is fitted.

The prosthesis. The artificial limbs are of light aluminum covered with leather. There are windows where the pins emerge to be attached to a metal loop at each end. In the forearm, contraction of the flexor group opens the hand, and contraction of the extensor group closes the hand. In the upper arm, contraction of the biceps closes the hand, and contraction of the triceps opens the hand. A strap from the ipsilateral shoulder pronates the hand and the spring supinates it again. A strap from the contralateral shoulder flexes the elbow and gravity extends the elbow. There are locking devices easily manipulated by buttons on the outside that lock the elbow in a fixed position and the forearm in a fixed position of rotation, if desired, and there is one at the wrist that locks the hand grip. A pencil may be grasped between the thumb and opposing hand and by locking the hand mechanism the grip is maintained without muscle effort. The hand can close further but cannot open.

C. FRED GORRINGER, M.D.

SURGERY OF THE BLOOD AND LYMPH SYSTEMS

BLOOD VESSELS

Hodges, H. H. and Freeman, N. E.: Thrombophlebitis on the Medical Service of a General Hospital. *Am J M Sc.*, 1947 213 226

The subject of thrombophlebitis and embolism has received increased attention in the surgical literature during recent years. The authors had occasion to study 20 instances of thrombophlebitis occurring in 9 patients all of whom were American soldiers. They discussed the diagnosis and divided the cases into (1) thrombophlebitis limited to the calf veins (2) thrombophlebitis limited to the calf and femoral veins, and (3) iliofemoral thrombophlebitis. They discuss their treatment and results and summarize as follows:

Ten instances of thrombophlebitis in the lower extremity were observed on the Medical Service of a General Hospital during a 4 month period.

Eight of these cases developed in patients with scrub typhus fever.

Early diagnosis was not achieved until they began to look carefully for the early signs.

In the authors opinion, treatment of thrombophlebitis should be individualized according to the location and extent of the lesion.

a. Thrombophlebitis confined to the calf veins was treated by lumbar paravertebral sympathetic block with uniformly good results. This procedure probably tends to prevent central propagation of the thrombus. Embolism did not occur and the patients were spared the prolonged disability which follows ligation of the femoral vein. The use of heparin or dicoumarin in these cases might help prevent propagation of the thrombosis. However its use is usually unnecessary. The concomitant use of anticoagulant and lumbar sympathetic block is prohibited by the danger of retroperitoneal hemorrhage.

b. Thrombophlebitis involving the calf and femoral veins was treated by proximal ligation. Sympathetic block was used only for relief of the pain after ligation. In a case of thrombosis of the calf vein with extension into the femoral vein, paravertebral procaine block prior to femoral ligation was followed promptly by pulmonary embolism.

c. Iliofemoral thrombophlebitis was treated with heparin, high ligation being inadvisable in these sick patients. The results were satisfactory.

This choice of therapeutic methods for the treatment of specific thrombotic lesions seems rational. It has been successful thus far in preventing embolism and in minimizing disability.

In addition to these specific measures all three groups of patients were treated by elevation of the extremity, administration of a compression bandage bed exercises, and early mobilization.

The authors observations suggest that all cases of iliofemoral thrombophlebitis do not necessarily re-

sult from extension of a thrombosis of the calf vein such a process may originate occasionally in the iliofemoral region.

PAUL MACKELL, M.D.

Blalock, A.: The Use of Shunt or By Pass Operations in the Treatment of Certain Circulatory Disorders, Including Portal Hypertension and Pulmonic Stenosis. *Ann. Surg.* 1947 125 129.

The purpose of this article was to discuss certain abnormalities of the circulatory system in which treatment by shunt or by-pass operations is proving effective or may be found to be useful. Particular emphasis has been placed on the treatment of portal hypertension and pulmonic stenosis.

Before the discussion of the individual disorders some general remarks pertaining to blood vessel anastomosis were made. It is most important that the anastomosis shall remain patent. This is dependent to a considerable extent upon the caliber of the vessels that are used and upon the expertness with which the anastomosis is performed. The anastomoses most apt to remain patent are those in which there is the greatest difference in pressure on the two sides of the union. It is probable that the anastomosis of a systemic artery to a vein would be most likely to remain patent, that of a systemic artery to a pulmonary artery would rank next, of an artery to another systemic artery would rank third and a vein-to-vein anastomosis would be least apt to remain open.

A vein-to-vein anastomosis is more apt to remain patent when the suture method is used as compared with the anastomosis method employing the vitallium tube. In the anastomosis of large arteries, such as the aorta, the author is of the opinion that the suture should be an everting one and should include the entire thickness of the wall of the aorta. In many cases only an end-to-end suture is feasible in others an end-to-end anastomosis may be done, as for example, the end of the splenic vein to the side of the renal vein. It was found that 90 per cent of the splenorenal anastomoses remained patent when the end-to-side method was used whereas only 73 per cent of the end-to-end anastomoses remained open.

The author notes that a by-pass or shunt operation should be considered in hypertension of the portal vein or its tributaries. Although it is not always possible to be sure as to the nature of the block it is usually possible to predict, on the basis of studies of liver function whether the hypertension is due to portal cirrhosis or to extrahepatic blockage. A discussion is presented relative to information to be gained about the nature of the block from certain clinical observations. Portacaval shunt (anastomosis of the portal vein and inferior vena cava) operations are still in the experimental stage and much remains to be learned about the choice of patients for operation and the choice of operative pro-

cedure. It does appear however that the principle of portacaval shunts in the treatment of ascites and gastrointestinal bleeding is a much sounder one than those of operations previously advocated.

The following impressions which have been gained from the author's experience are presented (1) anastomosis of the portal vein and inferior vena cava is preferable when indicated to a splenorenal union in that it will conduct more blood and is more apt to remain patent, (2) if a splenorenal anastomosis is performed suture of the proximal end of the splenic vein to the side of the renal vein is preferable to an end-to-end anastomosis (3) suture of the divided distal end of the portal vein to the side of the inferior vena cava is preferable to a side-to-side anastomosis since the opening is more apt to remain patent and (4) it is not necessary to occlude the inferior vena cava completely while performing a portacaval shunt.

A shunt or by-pass operation may be indicated in the treatment of coarctation of the aorta. Other conditions besides that of pulmonary stenosis in which a shunt or by-pass operation may be used are briefly mentioned. The splenic artery may be used for conducting blood to the left kidney the splenic artery may be used as a replacement for the first part of the superior mesenteric artery. The internal mammary vessels, when joined to the mesenteric vessels of a segment of jejunum, may be employed in the creation of an artificial esophagus. In aneurysm of the first part of the common carotid artery the adjacent subclavian artery may be substituted for the carotid.

In cases of pulmonary stenosis or atresia, the underlying principle in the choice of patients for operation is that there be inadequate flow of blood to the lungs. Although the clinical history may be of some aid the two outstanding features are that (1) the pulmonary artery is small in size and (2) there is roentgenographic evidence of absence of congestion in the lung fields. A diagnostic method which should be available and which has not been used to the desired extent is that of visualization of the heart and great vessels after the injection of radiopaque substances.

In most instances the author prefers an end-to-side anastomosis, that is, the union of the end of a systemic artery to the side of one of the two pulmonary arteries. In most patients who are more than 2 years of age the subclavian artery is the vessel of choice. Discussions of the technical features of the operation are presented. Two hundred and forty three patients who were thought to have the "tetralogy of Fallot" have been operated upon by the author and his associates. The over-all mortality rate has been 21 per cent. The mortality rate in the second 100 patients was 15 per cent. In the patients (approximately 147) in whom an anastomosis between the end of a subclavian artery and the side of the pulmonary artery was performed the mortality rate was 9 per cent. On the other hand the mortality rate among those in whom the carotid or innominate artery was used (approximately 57) was 33 per cent. It was also noted that because of a long waiting list

of patients, those chosen for an early operation were doing rather poorly but postponement of operation would have been a serious risk. There have been no instances of pyemia or mediastinitis in the patients operated upon.

HARRIS F. THURSTON, M.D.

De Takats, G., and Evey M. H.: Peripheral Vascular Sclerosis. *J. Am. M. Ass.* 1947 133 441

Peripheral vascular sclerosis is the overwhelming single cause of deficient arterial circulation in the lower extremities. Four grades of this disease can be recognized. The authors give the data of a series of 57 carefully selected cases and group them according to the severity of the disease.

Group 1. These patients have diminished or absent pulsations of the foot or lower leg. The skin is warm and the color of the feet is normal. They can walk a distance of from 2 to 6 blocks without pain. Lumbar sympathectomy was performed in 18 of such patients. The authors state that the improvement in walking in some of these has been dramatic. These persons have been restored to their full earning capacity. In 8 other patients included in this group there was no improvement in the claudication although the foot and lower leg became warm and dry. The authors raise the question as to whether claudication can be relieved at all by sympathectomy.

Group 2. The feet of the patients in this group are pulseless, and their ability to walk without pain is reduced to less than 2 blocks. Trophic changes may still be absent, although the feet are cold and dry and a single toe is often cyanotic. A cold and moist foot always gives a better prognosis because such patients exhibit a heightened sympathetic tone the release of which warms up their skin. Of 8 patients in this series only 1 required amputation. Sympathectomy helps in that cyanosis may disappear and a pre-gangrenous leg may be converted into a warm dry extremity.

Group 3. There is pain at rest and intractable ischemic neuritis. Walking may be less painful or even offer relief when rest in bed is difficult. When the foot is ice cold and when arteriolar obstruction and capillary paralysis are obvious from the pronounced dependent rubor sympathectomy is of no use and may precipitate gangrene. In one form in which the pulseless foot is hot, an osteoporotic and causalgic state exists, and after a satisfactory response to sympathetic block, a sympathectomy has averted amputation.

Group 4. The patients exhibit ulceration and gangrene of the digits or parts of the foot. The lesion is dry and not too painful. The popliteal pulse is absent, and possibly the femoral pulse is also absent. Supracondylar amputation at the level of positive histamine flares used to be the surgical procedure of choice in these patients. However, a sympathetic block may so shift the level of circulatory efficiency that a lower leg or a metatarsal amputation can be tolerated. This is an important group since patients can be discharged with a heel



Fig 1 (Servelle) Left, Aneurysm of the right popliteal artery Right, Same patient. Aneurysm of the left popliteal artery

stump below the knee or at metatarsal levels, but they would never have tolerated such an amputation without sympathectomy. The author describes the type of amputation used in such cases. He then discusses the technique of lumbar sympathectomy on the lower extremity. The results were as follows:

1. The extremity warms up faster and cools more slowly on direct exposure. Reflex effects of heat and cold are ineffective.
2. The high vasoconstrictor tones in the sitting or standing position is abolished.
3. Vascular exercises such as intermittent venous hyperemia are more effective.
4. Any cross stimulation between sympathetic and demyelinated sensory fibers is abolished.
5. During effort the sympathetomized extremity will not cool off on the contrary it may become warmer.

The authors summarize their article as follows:

A group of 57 patients with vascular sclerosis of the lower extremities has been studied. If after preliminary block of the lumbar sympathetics the temperature of the digits rose, walking ability improved and generalized vascular involvement was not extensive a lumbar sympathectomy was performed. In one group of patients this operation resulted in a dramatic increase in walking ability, in a second group amputation was averted in a third group intractable neuritic pain of the causalgic type was benefited and in a fourth group amputation could be performed at a lower level. In rigidly selected cases of peripheral arteriosclerosis, lumbar sympathectomy has been of great value. PAUL MERRILL, M.D.

Servelle, M: Arteriography and Heparin in the Surgery of Arterial Aneurysms. (Arteriographie et héparine dans la chirurgie des anévrismes artériels.) *Res chir., Par.*, 1946 65 373

A frequent error in the differential diagnosis of arterial aneurysm is that dilatation of the vessel in

its whole length (mega artery) is mistaken for an aneurysm. In this condition arteriography is an invaluable diagnostic help. Since the two disturbances require a very different kind of treatment, arteriography in all doubtful cases prior to surgery seems to be indicated. Furthermore in cases of true aneurysm arteriography gives an exact picture of the size and position of the sac and its relation to the artery and enables the surgeon to decide before the operation which type of intervention is indicated.

The second part of the article is devoted to the use of heparin as an anticoagulant in the surgery of aneurysm. The author prefers heparin to dicoumarol because its effect takes place more rapidly and the heparin is eliminated in a much shorter time than dicoumarol. Consequently there is no danger of secondary hemorrhage.

Heparin is applied topically as well as by intravenous injection. Preoperatively the suture material for the arteries is soaked in a 10 per cent heparin solution and during the operation the arterial wall and the aneurysmal sac are irrigated with a 2 per cent solution in saline solution. After the operation, 2 c.c. of heparin are injected intravenously for 3 days. As suture material for the arteries, the author uses linen (No. 0 or 1) and warns against the small threads of silk or catgut (000 or 0000) which are not resistant enough.

WERNER M. SOLMITZ, M.D.

BLOOD TRANSFUSION

Sabaneev D P: Plasmol S-25. *Vrachebnoe Delo* 1946, No 9, 618.

The Kiev Institute for Blood Transfusions and Emergency Surgery has produced a preparation from the blood plasma and serum of the human being which has been designated plasmol S-25. This material is for use in the method of tissue therapy developed by Filatov. The material has been dried in vacuum

at various temperatures (not above 30 C) and under various conditions of temperature and humidity so as to vary to any desired degree the development of the "conservation factor." The resultant product can then be dissolved in any desired amount of fluid and injected subcutaneously or intracutaneously under exact conditions of dosage. The present product was the twenty-fifth in the series and was thus designated plasmol S-25.

When the plasmol is injected into the ear vein of the rabbit it produces an initial vascular spasm (up to 30 seconds) followed by an intense hyperemia lasting from 15 to 30 hours. When perfused through an isolated organ (the kidney) in 1 to 1,000 dilution the rate of drop coming from the corresponding veins is reduced to one-half. When injected subcutaneously some sensation of burning is produced however in more than 3,000 injections in the human being there was not a single unpleasant incident (abscess, phlegmon).

The preparation when injected into and under the cicatrices and keloids resulting from burns, or even when injected at a distance from the lesion in 27 patients in a dosage of 1 gm. every 5 days, resulted in marked improvement in 14 patients and improvement in 9. In the remaining 4 patients bits of tissue were transplanted instead of the plasmol. Two hours after intracuticular injection the scar would undergo an intense hyperemia lasting for 2 or 3 days and the following day there would be some edema. At the end of 6 weeks the scar would be soft and flattened, and among the cases in which the cicatrix was subsequently excised, there was not a single instance of recurrence. In 3 patients with warts, the warts had disappeared after 3 weeks of treatment, and injections of the plasmol made directly under the warts hastened their disappearance which occurred after 10 or 25 days. When treatment was started several of the patients were suffering from a mild case of boils these lesions would immediately dissolve in a serosanguineous liquid and dry up in a period of 2 or 3 days.

Following the subcutaneous injection of 1 gm. of the plasmol in the groin of patients with acute orchitis, the temperature would fall by 1° in from 6 to 8 hours, the pain would disappear within from 30 to 40 minutes and the infiltration would leave without trace after from 7 to 10 days. The same results were obtained in men with acute epididymitis, after 2 or 3 weeks, and in women with salpingitis, oophoritis, and parametritis the results were just as dramatic.

Of a group of 139 patients with ulcer who were receiving stationary or ambulatory treatment, some had undergone gastroenterostomy and some had duodenal ulcer and stomach ulcer. Treatment in these cases consisted of 4 injections of 1 gm. of the plasmol at intervals of from 5 to 7 days. The injections were administered under the skin of the abdomen along the outer third of a line drawn from the navel to the twelfth rib on the right side. In the patients so treated improvement would be noted by the end of the third week the pain had disappeared, and also the acid belching and vomiting. Analysis of the gastric content demonstrated marked lowering of the total acids. In a few patients the niche was observed to disappear after 6 weeks of treatment. Results were so good that now the patient is put on a general diet on the second day following the second injection. The patients soon regain their weight, become active, and their appetite improves. The roentgenological findings of the stomach content and stool show marked improvement and active regeneration appears in the blood picture.

A special group of cases was made up of patients with nerve diseases: hemiplegia on a traumatic basis (3 cases), lumboschialgia (9 cases), spondylorheumatism (4 cases) and neuralgia of the trigeminal nerve (3 cases). In the lumboschialgias the stiffness in the loins and pains disappeared in 20 or 30 minutes after the first injection and no repetition of the injection was necessary. Voluntary movements of the extremities in the cases of hemiplegia and the power of speech in 1 patient with an accompanying aphasia, were recovered after 6 weeks of treatment. The trigeminal neuralgias disappeared after the fourth injection.

A large group of cases presented nonhealing wounds and trophic ulcers. In these the plasmol was injected in 1 gm. doses immediately under the sore at 5 day intervals. On the second day after the first injection the ulcer began to clear up, the granulations assumed a healthier appearance and in some instances an intense phagocytosis appeared, which increased with the following injections. The same results were attained with injections at a distance. The wounds or ulcers were completely healed in 2 or 3 weeks, no matter how long the ulcer had been present before treatment.

Future articles will give greater detail regarding the chemical and mechanical mechanisms, as well as the experimental work on this preparation, which is being carried on at the present time.

JOHN W. BRIDGEMAN, M.D.

SURGICAL TECHNIQUE

OPERATIVE SURGERY AND TECHNIQUE POSTOPERATIVE TREATMENT

Wangensteen, O. H.: Care of the Patient before and after Operation. *England J. M.*, 1947, 236, 121

Poor risk patients undergoing extensive surgery demand careful consideration as to water requirements. The urine output and the specific gravity of the urine serve as fairly satisfactory guides in determining how much fluid to give. A 24 hour output of 1,000 to 1,500 c.c. of urine is optimal. A fluid intake of 2,500 to 3,000 c.c. or 1,000 to 1,500 c.c. of fluid is optimal. Glucose solutions in water are given on the day of operation. If an inlying duodenal tube is in place to which suction is being applied allowance must be made for such electrolyte loss. A good working rule is to estimate the loss of sodium chloride at 5 gm. per liter of gastric aspirations. In the author's experience the weighing scale is superior to other procedures in determining early variations in the state of hydration. Patients are weighed daily before surgery to establish the normal weight.

Postoperatively beginning usually on the day after operation the patient is weighed either on a portable scale brought to the bedside or by means of a bedside scale which permits weighing the patient in bed. The method can be readily carried out to an accuracy of 100 gm. In a patient weighing 70 kgm this figure represents a 14 per cent of the body weight. Over the short postoperative period when the weighing scale is utilized, it is reasonable to assume that most of the weight fluctuation represents differences in body hydration. The basic caloric requirements of the patient after operation are usually met by the daily intravenous administration of 3,000 to 3,500 c.c. of 10 per cent glucose solution. If an inadequate amount of sodium chloride is given at the same time a liberal urine output may follow and dehydration will ensue in a few days if the electrolyte loss is not restored. Saline solution is ordinarily satisfactory to restore the electrolyte balance. It is the practice of the author to await evidence of diuresis before utilizing intravenous saline solutions.

Patients whose food intake has been poor and who have lost considerable weight are poor subjects for operation. These patients are considerably improved by feeding a mixture rich in proteins and carbohydrate and low in fat provided there is no pyloric obstruction. For those patients with pyloric obstruction the preoperative preparation is accomplished by the intravenous feedings of amino acids, plasma and glucose. The diet should be fortified with adequate amounts of vitamin C and vitamin K.

FRANK F. KANTAK, M.D.

Marino, H.: Surgical Treatment of Gigantic Nevus (Tratamiento quirúrgico de los nevus gigantes). *Prensa med. argent.*, 1946, 33, 1321

Nevi of many varieties (verruccous pilous moluscum hypertrophic, pigmentary avascular vascular) are common dermatologic diseases. In addition to a nonesthetic aspect they always present the possibility of malignant change which indicates radical treatment even if a small depressed scar is left. The author does not favor prophylactic extirpation of all nevi but sticks to the rule proposed by Adair: Leave the brown moles alone, be concerned only with those which contain definitely black pigment.

Once extirpation is decided upon it must be radical in order that no after effects will occur. It can be performed by galvanocautery, diathermocoagulation or surgical excision. As for pigmentary moles with melanotic cells, the only possible treatment is surgical excision with minimum disturbance of the dangerous cells. Most delicate handling of the tissues and incision at a good distance from the tumoral border.

The problem becomes more serious if the nevus is very large. Gigantic nevi always of congenital origin may cover any part of the body. They are often tuberosus hypertrophic, pigmentary or papillomatous. The only possible treatment is surgical excision and the raw surface is covered with a graft, either free or pedicled. In cases of this type, if the operation is to be in one stage it is advisable to prepare the

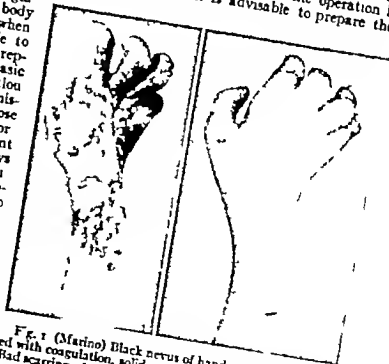


Fig. 1 (Marino) Black nevus of hand and forearm treated with coagulation, solid carbon dioxide and irradiation. Bad scarring with radiodermatitis, loss of extensor tendons and ankylosis of the joints with deviation of the hand. Large pedicled graft from abdomen. The patient is satisfied and does not want the complete plastic repair.

patient carefully to avoid the danger of shock due to the large bleeding area left by the extirpated tumor and the donor graft. Blood and plasma transfusions will be of value during and after the operation. Naturally if the patient's condition requires it, the procedure can be divided in more stages. However, the author prefers the extirpation *in toto* (one block of the diseased tissues) followed by immediate grafting whenever possible, even if there was some infection of the lesion.

As for the skin required to cover the raw surface, preference is given to the free graft, the pedicled graft being employed only to cover joints and tendons, or in case of lack of subcutaneous tissue. A free graft will almost always give good results as the tissues under a nevus can be considered as normal. On the face the full thickness graft can be used, but a good thick split graft is equally satisfactory and does not present the problem of coverage for the donor area.

Technically all cases must be carefully studied as there will be difficult problems of selection of the donor surfaces, immobilization, and dressing, which are the key to success. Padgett's dermatome is a great help in obtaining the necessary skin and long strips may be cut which in some cases are wrapped around a limb as a cutaneous bandage and fastened with only a few running stitches. Electrocoagulation is used to control bleeding. As for the dressing, it is fixed by an immobilizing plaster cast.

HENRIER MARINO, M.D.

Macomber, W. B., and Rubin, L. R.: Tubed Pedicle Complications in Repair of Massive Tissue Defects. *Plast. Reconstr. Surg.* 9:47 10.

In a study of more than 300 tubes which was made at an Army General hospital, the authors have listed the complication which developed in the making and transferring of tubes. In these cases, despite various minor erosions, all but 3 transfers were completed.

The tubed pedicle, with its network of blood vessels in the subcutaneous layer provides an excellent medium for filling large defects. The principles of

massive tissue movement are the same in all flap transfers. Several factors must be remembered. The main blood supply to the skin and subcutaneous tissue comes from vessels deep in the fat. These usually course just above the deep fascia with branches going upward to form an anastomosis beneath the dermis. Another layer of networks can be found just under the malpighian layer. It becomes apparent from this principle that in all massive tissue movements the fat and the deep fascia must be included in the flap if the blood vessels are to be included for nutrition. Tension serves to stretch the elastic fibrils in the skin and constrict the vessels, which causes death of the tissue. The graft is dependent upon a delicate blood supply therefore gentle handling of the tissue is essential. Rough manipulation causes thrombosis of the blood vessels. The skin itself is never held with a forceps. Blunt dissection with scissors or the fingers is never used to separate layers. Hooks are excellent to hold tissue. Raw surface must not be left uncovered unnecessarily without moisture. Tissue holding by the hands should be limited to absolute necessity.

Perhaps all the necrosis along the line of suture can be traced to tension. Too much fat is included in the tube or conversely the tube is insufficient in width. The safest way to avoid this complication is to mark out the prospective tube flap on the skin with methylene blue. Only one incision is made at first. The flap is undermined completely from this one incision, dissection being done with a sharp knife along the fascial plane. All bleeding is carefully stopped. When the undermining reaches the line previously marked on the skin, an attempt is made to fold the skin under as it is to tube it. The authors indicate that turning a tube with No. 8 silk for the skin only is adequate.

The need for subcutaneous sutures or heavier skin silks is indicative of too much tension. Should the tube be too tight despite all of the precautions taken, it is advisable to employ a split skin graft on the under surface of the flap, as well as on the donor site instead of trying to make the tube. Whenever a very long tube is used, the length must be balanced by adequate width to insure an adequate blood supply at the center of the tube.

The authors warn against completion of delayed transfer in one stage because necrosis of the tip may result. Infection and hemorrhage are the main complications of secondary delays. In this delay all long vessels coming into the distal end of the flap are ligated.

The procedure of transfer of the tube and flap requires great care. The flap is lifted from the donor site and both the tube and flap are carefully observed. Any blanching is a signal for return. The complications are many. Arterial changes may be noted at once by blanching.

Poor venous return can be noted early by bluish discoloration. To facilitate venous return, it is best to have the recipient site at a higher level than the donor site. The flap must fill the defect. It cannot, however be stretched in any way. Normal skin ten-



Fig. 1. (Macomber) Illustration of folding of skin flap to see if it will tube easily. This must be done the entire length of the tube, since folding at the corners diminishes the length of the free tube. The easy folding must be present along the entire desired free length.

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sion is necessary to prevent kinking of the vessels. Any twist, kink or angulation of the tube will interfere with the circulation and cause necrosis.

C. FERN GONZALEZ, M.D.
Escobar Pacheco, A.: Venous Ligation in Pulmonary Infarction (Ligadura venosa en los infartos pulmonares). *Arch. Soc. C. Hosp. Santiago*, 1946, 16: 555

In a study of 15 cases of pulmonary embolism of which 7 revealed mitral involvement, 3 aortic insufficiency, 2 phlebothrombosis, 2 Hodgkin's disease, and 1 hypertension the author found the following symptoms: hemoptysis in 12, cyanosis a disease, pain in 6, subicterus in 12, cyanosis in 7, costal rigidity in 5, doubtful Homans sign in 3, costal rigidity in 1 and pain in the calf in 1.

Venous ligation was practiced in all of the cases. In 1 case was subjected to ligation and section of the femoral vein, 5 to ligation and section of both femoral veins, 6 to ligation of both iliacs and 3 to ligation of the inferior vena cava. All of the operations were done in three stages. First a simple ligation of the internal saphenous was done. Then simultaneous ligation of the collateral after aspiration by means of a cannula, both the afferent and efferent vessels expelling clots. In the second stage, a 5 cm. vertical incision medial to the palpable femoral artery was made and on reaching the femoral vein the afferent portion was ligated twice while the efferent was between the ligatures. The third stage was done by no impairment of the circulation of the limb as evidenced by edema and cyanosis. In this stage the external iliac were ligated by means of a 5 cm. incision above Poupart's ligament, the location of the femoral artery being at the midpoint of the incision. The skin was opened and the aponeurosis of the external oblique muscle was incised. With the separation of the internal oblique and transversus abdominis muscles, the transversus fascia is next opened which brings into view the iliac artery and vein. A Deschamps needle is used to pass a ligature from the lateral to the medial side to avoid the risk of puncturing the artery. The vein is ligated without section. In the last stage the vena cava is ligated through the pararectal incision on the right side, which passes through the external oblique muscle and the retroperitoneal tissues. The vena cava is ligated above and transverse abdominal muscles, peritoneum, and the union of the common iliac and below the renal veins. Local anesthesia was used in all except 1 case.

The circulation was re-established by means of the pudendal, circumflex epigastric, and gluteal veins which unite with the internal iliac and gluteal veins, or parietal, ilio-lumbar and lateral sacral veins which empty into the inferior vena cava by means of the azygos.

This procedure brings about a marked and immediate improvement in the subjective and objective condition of the patient in relation to the cardiac

insufficiency. It was shown that there is absolutely no harm done to the return flow of the legs by ligating both femoral veins or both iliacs, and even the vena cava, at the point indicated. Not only is it necessary to intervene early before the thrombus reaches a place not accessible for venous ligation but also to ligate as high as possible.

ARTHUR F. CYRILLA, M.D.
133 and 1947

Stewart, J. D.: Wound Shock. *J. Am. M. Ass.* 1947

Although it is recognized that there are many causes of shock in battle casualties there is considerable evidence to indicate that loss of blood dominates the early picture in the majority of severe wounds inflicted by penetrating high explosive missiles.

A group of gravely wounded nontransportable casualties were examined in forward field hospitals a few miles behind the battle line. All were in actual or imminent shock on admission. All were in actual traumatic shock on admission. Compound fractures, traumatic amputations and penetrating abdominal and thoracic wounds predominated in the 200 cases studied. In the majority of cases the wounds were multiple. Seventeen of the 200 patients died under observation. The average interval between wounding and admission was 4.9 hours (maximum 25.2 hours). Plasma volume plasma reading were determined immediately after admission, and again 24 hours later after restorative therapy and operation. Further determinations were made subsequently. Reduction in blood volume of the patients was found to be the rule just after admission. Despite the fact that the average patient had received a pint of plasma and a small amount of blood, his blood volume had risen to 95 per cent. In some cases oligemia was still present at the end of 24 hours, despite replacement therapy and presumably further loss of blood had taken place. Undercorrection was most common. It was found that at the end of 25 hours the average was still 5 per cent below normal, and there was an associated reduction in the hematocrit reading and on the basis of this study the average soldier receiving a serious shock producing wound must be given at least 2,000 c.c. of blood if the volume of blood is to be restored to approximately normal in 24 hours. Studies made later show that the quantity of blood required to maintain normal hemoglobin and plasma protein values during the early period of repair of the wound and convalescence.

It appears that in traumatic shock some correlation exists between the lowering of systolic blood pressure and the degree of oligemia that is the initial blood volume is lower in those cases with lower systolic blood pressure readings. Thus in 5 patients who were admitted with a systolic pressure of zero the average initial blood volume was 58.7 per cent in 20 patients with an initial systolic blood pressure of less than 100 the initial average blood volume was

77.3 per cent and in a group of 21 patients whose systolic blood pressure at the time of admission was 100 or over the initial average blood volume was 81.6 per cent. If the entire group of severely wounded casualties is divided according to the initial reading of the blood pressure, it is found that the amounts of plasma and blood administered in the first 24 hours showed some correlation with the blood pressure readings. The lower the blood pressure, the greater the amount of blood and plasma considered clinically necessary and given in restorative therapy.

It is believed that the average loss of blood was 2,500 to 3,000 c.c., or about half the normal volume of blood. The depletion of blood volume in traumatic shock could conceivably be due to loss of water and electrolytes, loss of plasma or loss of whole blood. Accordingly the concentrations of plasma protein, red cells, and nonprotein nitrogen in the plasma were of interest. It was found that the average concentration of protein in the plasma on admission was 6.5 gm. per 100 c.c., and that the average red cell hematocrit reading was 37.3 per cent. The average nonprotein nitrogen value in the plasma was 30.8 mgm. per 100 c.c. These values offer confirmatory evidence of the absence of anhydremia. Hemodilution, which is a characteristic physiological response to severe hemorrhage, was a uniform finding in this group of patients.

If one considers the typical hematic changes in wound shock, namely oligemia and reduction in concentration of hemoglobin and plasma protein, there seems to be little room for debate over the relative merits of plasma and blood in repair. Evidence indicates that massive quantities of blood are lost. Relief of tissue anoxia, under the circumstances, is an urgent requirement to be met by replacement of circulating hemoglobin values and improvement in the amount of oxygen carried by the blood.

During convalescence it was evident that blood volume plasma protein concentration, and the hematocrit reading remained low for days or weeks. Plasma volume soon became normal. The persistent deficit of hemoglobin and plasma protein is accompanied by overdilution, and some sacrifice of concentration is made in restoring the volume of blood to normal. The operation is at times essential to resuscitation and it is an important matter of judgment to know when to operate. The average interval between admission and operation was 4 hours.

Of the 100 gravely wounded patients, 17 died under observation. Only 5 died in relation to a possible state of "irreversible shock." However persistent hemorrhage and insufficient replacement of blood could not be excluded as likely causes of death in these 5 patients therefore this concept is open to question.

The present article is largely concerned with wound shock which is due to severe trauma, not including burns, and for the most part is still uncomplicated by such lesions as clostridial myositis, spreading peritonitis, or pulmonary thromboembolism.

LEROY J. KUMBARSKA, M.D.

ANTISEPTIC SURGERY TREATMENT OF WOUNDS AND INFECTIONS

Young, H. H., and Ghormley R. K.: Accidents on the Farm. *J Am M Ass* 1946, 32 768.

In the 9 years from 1935 through 1943 575 accidents on the farm caused the person injured to come to the Mayo Clinic. The majority of these patients came from the surrounding four or five counties, but the total number is not an index of the total farm accidents that occurred in those four or five counties. The clinic total may be said to represent with fair accuracy the number of serious accidents that occurred in these counties during that period. Included in the study were all accident cases encountered at the clinic which were due to falls, farm machinery livestock, injuries in the farm home buzz saws, etc. Omitted were all automobile and highway accident cases.

Falls led all other causes of accidents in this series and carried a mortality rate of 3 per cent per 100 accidents. The commonest accident of this type was that in which the patient fell off some piece of farm equipment. Accidents attributed to farm machinery followed falls in a close second place as the cause of farm accidents in this series there were 186 such accidents. Although there were no hospital deaths in this group, the morbidity rate was extremely high. Exactly a third of the patients in this group suffered from traumatic amputation of a part or the whole of one or more extremities. The tractor caused the largest single group of accidents and was followed closely by the corn picker, corn shredder and buzz saw. The third most frequent cause of the accidents in this series was livestock there were 104 such accidents. The mortality rate in this group was 5 per cent, 3 deaths were due directly or indirectly to horses, and 2 deaths were caused by bulls. Seventy seven of the accidents were caused by the axe, by falling trees, or by a group of unclassifiable causes. In the entire group of 575 accidents in this series, the injuries sustained consisted of 396 fractures, 65 traumatic amputations, 25 instances of transverse myelitis, 9 of perforating perineal wounds, 7 avulsions of the skin of the penis and scrotum, and 205 miscellaneous injuries. In this series of cases there were 18 deaths, a mortality rate of 3 per cent per 100 cases.

An educational program for the farmer is the first step in decreasing the number of accidents on the farm.

Brown, A.: Morphological Changes to the Red Cells in Relation to Severe Burns. *J Path. Bact., Lond* 1945 53 367.

In a previous study of the hematological changes in burns it was shown that burns involving more than 15 per cent of the body surface are frequently followed by a rapidly occurring moderately severe anemia which is associated with a slight increase in the mean corpuscular volume, increased erythrocyte fragility and increased plasma bilirubin and

urobilin excretion. The present studies are concerned with the variations in mean corpuscular volume, mean corpuscular diameter and mean corpuscular average thickness in relation to variations in osmotic fragility and the mechanism of production of the anemia in severe burns. Hemoglobin was estimated photoelectrically. Saline fragility was determined quantitatively by comparison with a standard equivalent to 50 per cent lysis as determined by a Duboscq colorimeter. Red cell diameters were measured by microprojection on millimeter-ruled graph paper magnified to 1,000 diameters. Evenly spread cover slip preparations stained by Leishman's stain were used and 400 cells in each film were measured.

Investigation of the morphologic changes occurring in the red cells of 3 very severely burned patients showed that fragmentation of the red cells and microspherocytosis occur within a few hours of the injury and are associated with an increase in the mean corpuscular average thickness. The morphologic changes occurring in the red cells in burns can be attributed to the direct action of heat on the cells. The maximum effect is immediate fragmentation and destruction. If the damage is less severe, microspherocytosis is produced and the affected cells are unduly susceptible to the physiological trauma of the circulation. Hemoglobinemia and hemoglobinuria may occur according to the magnitude and rate of hemolysis.

FRANK F. KANTHAAR, M.D.

Gubern Sallaesche, L.: The Vegetative Nervous System and the Anesthetic Infiltration of the Sympathetics in Traumatology (El sistema nervioso vegetativo y las infiltraciones anestésicas del simpático en traumatología) *Cirujía apar. locomotor* 1946, 3, 97

All trauma necessarily produces a necrosis which brings into consideration adaptation mechanisms, the aim of which is to re-establish the physicochemical equilibrium of the tissues which are altered by the lesion. Humoral and nervous factors are in close correlation. The humoral factors are seen as a zone of static hyperemia surrounding the focus while this in turn is surrounded by a more extensive zone of active hyperemia produced by the liberation of histamine-like substances. Among the nervous factors is an axonic reflex, which in the periphery gives rise to muscular contracture and muscular atrophy and results in pain in the central portion. The healing of the necrosis is favored by rest and the active vasodilatation produced by local anesthesia and anesthesia of the sympathetics.

Treatment of 300 or more cases by anesthetic infiltration of the sympathetics resulted in a decrease of the pain and healing time. The following routine was carried out: the use of 3 infiltrations of novocain per week until the condition was cured or if a solution of novocain in oil was used only 2 infiltrations per week were necessary. After 15 or 20 days treatment with infiltration was suspended in the bone lesions and after 8 days in the traumatized tendons or aponeuroses. In trauma which manifests a doubt

ful mechanical disorder the first 2 infiltrations gives one an idea as to whether or not to apply orthopedic treatment, while sometimes the infiltrations only decrease the edema of the traumatized area, which makes complete mobilization possible. It also gives excellent results in post traumatic ulcers although sometimes ganglionectomy must be done. The draw backs to this procedure are as follows: (1) the technical difficulty especially in lumbar infiltration (2) the pain produced by the injection and (3) the limited time of action.

The best results were obtained when Feng's mixture was used which consists of novocain, acetylcholine and vitamin B. ARTHUR F. CIPOLLA, M.D.

Rustigian R., and Cipriani, A.: The Bacteriology of Open Wounds. *J. Am. M. Ass.*, 1947, 133, 224.

As part of a study of penicillin therapy in the management of wounds in Italy a total of 214 types of bacteria were isolated from 27 infected and 9 clinically clean wounds. 45.3 per cent (97) of the 214 isolates representing several genera, were obligatory anaerobes and 15.9 per cent or 34 cultures (streptococci and micrococci) were microaerophiles. This emphasizes the decidedly anaerobic environment of the bacteria in these traumatic injuries. The clean wounds differed from the infected wounds in the absence of pyogenic cocci. Beta hemolytic streptococci, *Staphylococcus aureus*, *Staphylococcus albus*, enteric streptococci, clostridium *Proteus*, *Pseudomonas* and coliform bacteria appear to be the species most frequently encountered. Other species less frequently reported include undifferentiated streptococci, an aerobic streptococci, micrococci, bacteroids, diphtheroids and bacilli.

The 214 bacteria isolated were differentiated under 3 functional entities: (1) toxigenic and/or invasive, (2) proteolytic, and (3) wound commensals. Of the toxigenic and/or invasive bacteria there were 33 in the following order: *Staphylococcus aureus*, hemolytic streptococci, *Clostridium perfringens*, *Clostridium novyi*, *Clostridium septicum* and unidentified clostridia.

It was noteworthy that bacteria-producing proteolytic enzymes occurred with a relatively high frequency in 103 of the 214 isolates tested. There were 63 in the hydrolyzing proteins group and 16 in the group producing hydrogen sulfide and/or visible gas from peptones.

There were 102 in the group of commensal bacteria. It is, of course, known that a synergistic relationship resulting in considerable wound involvement, may occur.

The combination of various bacteria in each of 36 wounds had been reported previously. In the final analysis, the interplay of metabolic activities of the true pathogens—the proteolytic bacteria, and those regarded as wound commensals, may be of major importance in the development of infection. The combined proteolytic reactions of several bacteria might be much more effective in causing septic decomposition of dead tissue than their individual reactions.

It is concluded that lines of demarcation of infection of wounds appear to be more practical clinically than bacteriologically. It is pointed out that although penicillin is very effective in the treatment of certain combinations of wound infection, surgical treatment is essential in the ultimate care of these infections.

LEROY J. KILGUSSEN, M.D.

Glenn, F.: Tetanus—A Preventable Disease. *Ann. Surg.* 94b, 124 30.

In the battle for Manila, the civilian population was not only subjected to injury from the besieging Americans, but also it suffered the restrictions of medicines, water, and food imposed by the Japanese. As a result, the incidence of tetanus among wounded civilians was high. In the San Lazaro hospital alone, 196 cases of tetanus developed in a group of 2 100 wounded non-combatants. However, not one case of tetanus developed in American military personnel engaged in combat in the same theater of operations. Compound comminuted fractures of the long bones, together with extensive soft tissue infection and damage, were most frequently associated with tetanus which appeared in from 3 to 30 days after wounding. Both varieties of tetanus, the local and general, were commonly found in the same patient. Common findings were trismus and orthostosis, followed rapidly by opisthotonus and the characteristic risus sardonius. Finally the tetanus progressed so as to involve the muscles of the abdomen, the neck, and the thoracic respiratory muscles. Trismus was present in all cases, whereas dysphagia occurred in about 75 per cent of all cases. Cephalic tetanus was not observed, but the deep reflexes were increased early in the disease. Protrusion of the eyelids or facial paralysis was observed in a small percentage of cases. Spasm of both the vesical and rectal sphincters was present in varying degree.

Surgical treatment in patients with tetanus, although of value for the sepsis and general condition of the patient, did not alter the course of the tetanus. Penicillin administered intramuscularly had no effect upon tetanus, neither did it show any effect when used topically in cases of local tetanus. The mortality rate from tetanus was 90 per cent with most of the patients dying within 10 days of the onset of symptoms. Morphine sulfate given in 0.08 gram doses proved of great value for the relief of the spasm. Paraldehyde and chloral hydrate were beneficial to a limited degree. The barbiturates were of little or no value. Ether in oil was effective in reducing convulsive seizures. Philippine physicians favored the use of a 25 per cent solution of magnesium sulfate given intramuscularly in 2 c.c. doses, but this caused severe respiratory depression. In the prewar years there were about 100 cases of tetanus yearly with a mortality rate of 25 to 35 per cent. There was little tetanus antitoxin available for civilian use.

There were no cases of tetanus among wounded soldiers in the Southwestern Pacific Area, while in the entire U.S. Army only 11 cases were reported during the war years and, of these, only 1 case developed in a combatant. This remarkable result was accounted for

only on the basis of immunization by tetanus toxoid and subsequent reinforcement by yearly booster doses.

Dr. Churchill, in discussing this paper reported that tetanus was found among the wounded German prisoners of war many of whom died. The Germans only immunized the Luftwaffe and special personnel. The Italian soldier was immunized against tetanus.

BENJAMIN G. P. SEAFROFF, M.D.

Lyons, C.: Chemotherapy in the Management of Wounds. *J. Am. Med. Ass.* 947 33 5.

The limited role of chemotherapy in the management of wounds is emphasized. The prevention of infected wounds is accomplished by active immunization with tetanus toxoid and initial surgical management. The major usefulness of chemotherapy is for the treatment of initial, reparative and reconstructive phases of the surgical management of a wound. This is most expeditiously accomplished by the systemic administration of the selected drug. Invasive infection demands the presence of hemolytic streptococci, staphylococci, or toxigenic clostridia. The clinical pattern or invasive infection indicates the presence of true pathogens but suppuration of a wound may be due to true pathogens, wound pathogens, or a combination. The combined experience of the last two World Wars has shown that the cleanly excised wound of soft parts develops invasive infection due solely to hemolytic streptococci. Suppuration of a wound is believed to be due more to the presence of a nidus of wound protein than to any specific bacterial virulence. No available antibacterial agent can completely sterilize an open wound. Topical, or local, chemotherapy has been discarded as ineffective and deleterious. Suppuration of a wound is an indication for repeated surgical treatment of the wound.

Closure, not sterilization, of the wound is the practical objective of the early phases of management. Efforts to abolish infection are necessarily integrated with efforts to expedite the healing of the wound. The most important accessory procedures in this regard are the correction of anemia and the restoration of tissue protein deficits. The known depressant effects of sulfonamide compounds on hematopoiesis, the intestinal synthesis of essential metabolites, and the appetite in general are further reasons to establish penicillin as the chemotherapeutic agent of choice in the management of wounds.

The author reviews the experiences which show that the persistence of devitalized tissue or sequestra prevents chemotherapeutic sterilization of the wound. Many of the organisms are naturally resistant, and the most important of these is the *Clostridium sporogenes* which is resistant to sulfonamide compounds, penicillin, and streptomycin. The important aerobic gram-negative wound pathogens are resistant to sulfonamide compounds in exudates from the wound, are insensitive to penicillin, and inherit or readily acquire a resistance to streptomycin. Clinical experience with established infection has shown that the sulfonamide compounds are extremely effective

against hemolytic streptococci have a limited usefulness against staphylococci, and are relatively ineffective against gas gangrene. Streptomycin is ineffective against the clostridia. With the exception of individually resistant strains penicillin is effective against all the potentially invasive pathogens. Sulfonamide therapy has been shown to be adequate for the wound endangered only by hemolytic streptococci. Penicillin is the drug of choice for all other wounds subject to invasive infection. No virtue is attached to combinations of these two agents in the treatment of infected wounds.

LEROY J. KLEINMAN, M.D.

Hirsch H. L., Dowling H. F., Virino J. J., and Rotman Kavka G.: Penicillin in Beeswax and Peanut Oil: A New Preparation Which is Fluid at Room Temperature; Absorption and Therapeutic Use. *J. Lab. Clin. M.* 1947 32: 34.

The authors report the results of their experience with the use of a modified preparation of penicillin in beeswax and peanut oil which is liquid at room temperature. Following the intramuscular injection of 300,000 units, 18 out of 20 subjects had detectable concentrations of the antibiotic 12 hours after injection while only 5 of the 20 had significant concentrations after 20 hours. Six hundred thousand units were injected intramuscularly into 36 subjects, 20 of the 36 had assayable concentrations after 20 hours while all except 2 had significant concentrations after 12 hours. The subcutaneous administration of 600,000 units of the preparation was carried out on 20 patients all but one patient had detectable amounts of penicillin in the blood stream at 24 hours.

This preparation was used clinically with satisfactory results. Seven cases of previous penicillin resistant gonorrhea responded to a single injection of 600,000 units of penicillin in wax and peanut oil. A case of subacute bacterial endocarditis due to *Streptococcus viridans* was treated with 300,000 units every 12 hours and was later placed on 600,000 units injected once a day. The patient made an uneventful recovery.

F. J. LEXMAN, M.D.

Morgenson W. J.: Toxic Reactions with Penicillin. *J. Am. M. Ass.*, 1946 132: 975.

The toxic reactions to penicillin are classified and discussed according to the mode of action of the antibiotic.

Penicillin may act as a direct toxin and primary irritant. Certainly this direct toxic effect is minimal in therapeutic concentrations. Purification apparently tends to reduce the toxicity. For practical purposes penicillin has a direct toxic action only when used intrathecally and this toxic effect is due to the penicillin itself rather than to the impurities. However, this does not condemn the intrathecal use of penicillin in proper dosage. Probably the dose should never be in excess of 30,000 units when given by this route.

Penicillin may act as an antigen. The immediate allergic reactions to penicillin usually occur in a

person with a previous exposure to penicillin, but a small percentage of people are primarily sensitive to the drug. This may be because the individual possesses a general sensitivity to moulds. It has been suggested that an exacerbation of a previous fungus infection or vesicular eruption involving the feet, hands and groins following penicillin therapy may be due to this sensitivity. Penicillin sensitivity may be of short duration or it may last for long periods, and the sensitivity may be epidermal or dermal, although the principal shock tissue appears to be the vascular system. The allergic symptoms produced by penicillin sensitivity are usually mild, but may be serious appearing as a severe angioneurotic edema with edema of the pharynx, larynx and lungs, which may lead to a fatal termination. When a patient is sensitive to crystalline penicillin as shown by a cutaneous reaction, or suspected when different lots from various manufacturers give symptoms continued therapy should be used with extreme caution.

Penicillin may cause therapeutic shock or Jarisch Herxheimer reaction if used in cases of syphilis. Focal reactions of intensified chancre or the appearance of cutaneous lesions may result, or systemic reactions of malaise, generalized aching, painful adenopathy and temperature elevation may occur. Such a reaction occurring during the routine treatment of gonorrhea in which syphilis is not suspected is at least very suggestive of concurrent syphilitic infection. Fever following the use of purified penicillin is rare and should always arouse a suspicion of the Herxheimer reaction.

Penicillin may have an indirect action on the pathological process. Particularly in late syphilis too rapid healing of cardiac and liver lesions may result in deforming sclerosis.

In the discussion of the article it is pointed out that the rate of sensitivity to penicillin is significantly increasing and it is therefore most important that this antibiotic not be administered for trivial or unnecessary conditions. F. J. LEXMAN, M.D.

Frisk, A. R., Hagerman G., Helander S., and Sjögren B.: Sulpha-Combination—A New Chemotherapeutic Principle. *Brit. M. J.*, 1947 1: 7.

The formation of renal concretions is one of the most serious drawbacks to sulfonamide therapy. The authors advocate using a mixture of sulfonamides to obviate this danger. The use of such a mixture is predicated by the following statements: the antibacterial effect of a mixture of several different sulfonamides is the sum of the effects of the various compounds; (2) the sulfonamides of a mixture as well as their acetyl derivatives do not affect the solubility of each other and thus the use of a mixture of sulfonamides considerably reduces the incidence of renal concretions; and (3) the compounds in a mixture of sulfonamides are absorbed and excreted independently of each other. Experimental evidence is presented in support of these statements.

A mixture of sulfathiazole, sulfadiazine, and sulfamerazine was considered most suitable. The mixture (sulfadial) was made in the following proportion: sulfathiazole 37 per cent, sulfadiazine 37 per cent, and sulfamerazine 26 per cent. The authors believe that if such a mixture is used, and if, in addition, a high diuresis with alkalinization is produced, the risk of concretum formation in a normal kidney will be almost eliminated. This mixture has given good results clinically. F. J. LEEMAN, M.D.

Fowler, E. P. Jr., and Sellman, E.: Otic Complications of Streptomycin Therapy. *J. Am. M. Ass.* 947 133 87.

The authors call attention to the possibility of the occurrence of neurotoxic symptoms involving the vestibular and auditory systems following streptomycin therapy. They review the observations of other authors and report their own observations in the cases of 81 patients. They state that a high incidence of vestibular disturbance and a sizeable number of cases of deafness, either transitory or permanent, will occur with the use of streptomycin in large doses of the drug are given over prolonged periods.

The onset of otic symptoms usually occurs from the seventeenth to the twentieth day if 3 gm. of the drug per day are given. The patients in the majority of cases recover from the deafness, and even if the caloric response remains negative the accessory balance mechanism compensates well for the totally dead labyrinth so that this need not be feared. The mechanism of these otic complications of streptomycin therapy is unclear as yet.

Because of the possibility of otic complications, it is believed that the use of streptomycin should be carefully considered but that when indicated it should not be withheld because of this danger. The occurrence of otic symptoms during streptomycin therapy should call for a reconsideration of the case before continuance of therapy. The authors suggest that one audiogram and vestibular test be performed before the utilization of streptomycin therapy.

G. ALLEN LEVY, M.D.

ANESTHESIA

Burstein, C. L., and Alexander, F. A. D.: Anesthesia for Thoracic Surgery. Management in an Army General Hospital Overseas. *Anesthesiology* 947 8 36.

This communication is based upon observations made during anesthesia for 1,165 consecutive operations within the chest, with an overall mortality of less than 0.2 per cent. The more important specific problems in management are discussed. Completion of the surgical mission may be contributed to by anesthesia which protects the patient from untoward reflex changes, ensures ample oxygenation and carbon dioxide elimination by adequate ventilation, minimizes annoying motion of intrathoracic viscera, and results in as little disturbance of normal physiologic function as possible.

A technique of anesthesia intended to fulfill these requisites has been evolved by the authors during the conduct of cases in a military hospital. This technique consisted of rapid induction with a relatively large dose of pentothal sodium. In patients who had suffered recent hemorrhage, or were poor risks for any cause, the size of this dose was markedly reduced. Intubation was performed with a large bore Magill endotracheal tube with inflatable cuff (attached to a Waters to-and-fro canister of soda lime and a bag). Anesthesia was maintained with nitrous oxide oxygen and ether supplemented by continuous manual reinforcement of automatic inspiratory efforts—compensated respiration. Various procedures to prevent untoward cardiocirculatory reflexes and peripheral circulatory depression were applied. This technique proved safe and satisfactory in the instances in which it was used.

The authors believe that the greatest single factor contributing to the success in these cases was the insistence upon absolutely rigid adherence to sound surgical practice, not the least part of which is teamwork which begets mutual confidence among all individuals concerned. MARY FRANCES POE, M.D.

Devision, T. C., and Letton, A. H.: Muscular Relaxation in Abdominal Surgery with the Use of Pentothal-Oxygen and Curare; Report of Over 600 Cases. *South. Surgeon* 947 23 15.

The results obtained by the authors at the Georgia Baptist Hospital, Atlanta, with the use of curare with pentothal-oxygen in abdominal surgery have been so gratifying that its use there is now surpassing that of other forms of anesthesia. The authors have compiled the pertinent facts in the cases of 600 major operations in which this method was used. For comparison, statistics were also compiled on a corresponding group of cases in which pentothal alone was used.

The drugs are administered by three way stop-cocks, and oxygen is given continuously. The addition of curare diminished the amount of pentothal used, by 19.3 per cent and was undoubtedly the big factor in reducing the length of postoperative sleeping. In a few cases there was a drop in blood pressure. Artificial respiration was not indicated in a single instance. Phlebitis did not occur in any case.

The authors prefer the synergistic effects of pentothal-oxygen-curare in abdominal surgery. The induction is rapid, the effects pleasant for the patient, postoperative complications are lowered, and the danger of explosion is minimized.

MARY FRANCES POE, M.D.

Beard, J. W.: Pentothal-Curare Mixture. 4 *anesthesiology* 947 89 75.

The author describes the preparation of pentothal curare mixtures for use in anesthesia. After numerous experiments with varying percentages of curare and combinations of buffers with the pentothal curare mixture the present formula was found most suitable: 2.5% per cent aqueous pentothal sodium, 18.3 c.c. and d-tubocurarine, 1.5 c.c. (150 units).

This mixture shows no precipitation for 14 days although the solution darkens with age. A freshly prepared solution of pentothal sodium is necessary to prevent the formation of a precipitate when higher concentrations of curare are used. Solutions over 12 hours old should be discarded. It is advisable to add the curare to the pentothal solution while it is being agitated, to avoid a precipitation at the point of contact of the two liquids.

In the opinion of the author, 5 to 7½ units of curare per cubic centimeter of solution is the correct concentration of curare. Pentothal curare anesthetics (alcoholic and aqueous) have been administered in more than 50 cases with varying degrees of success. The series includes the use of this mixture for patients on whom cholecystectomy, gastrectomy, colectomy, radical mastectomy and plastic operations have been performed and for passing an endotracheal tube preliminary to the administration of cyclopropane. One half to 1 c.c. of the mixture was intermittently injected intravenously as required to maintain adequate muscular relaxation and depth of anesthesia.

It was noted that less pentothal was required in the cases in which the mixture was used than in some cases in which no curare was added to the pentothal solution. The curare solution obliterates many of the troublesome reflex movements which are seen during pentothal anesthesia. The period of recovery is usually shortened following termination of the anesthetic. Prostigmine was administered to patients to counteract an overdose of curare. Induction of anesthesia and recovery of the patient were without untoward incident. Muscular relaxation was adequate in all cases. Severe laryngospasm was not encountered even though the patient coughed when the glottis was stimulated by the endotracheal tube. The average amount of solution injected preliminary to passing the tube was 10 to 15 c.c. of the mixture.

MARY KARP, M.D.

Smith S. M., Brown H. O., Toman J. E. P. and Goodman L. S.: The Lack of Cerebral Effects of d Tubocurarine. *Anesthesiology* 1947 8:1

No unanimity of opinion exists as to the central properties of curare. Animal experimentation can provide, at best, only a partial and indirect answer as to whether curare exerts a central depressant or analgesic action in man. Therefore, it was thought desirable to obtain the subjective report of a trained observer under the influence of curare alone and not undergoing a surgical procedure.

In a normal subject, a dose (500 mgm.) of d tubocurarine chloride at least two and one half times that required to cause complete respiratory paralysis failed to alter the electroencephalogram or to impair consciousness, memory or sensorium. Significant effects on systems other than skeletal muscle were also absent.

Neostigmine given in fairly large dosage greatly facilitated recovery from the curare-induced paralysis. Although 3.5 mgm. of neostigmine methylsulfate

were given intravenously within a period of less than 2 hours no significant muscular action on the gastrointestinal tract, urinary bladder or cardiovascular system was observed and atropine was not required. Curare is usually considered to have no direct blocking action on smooth muscle cells. The stimulant effect of neostigmine on the constrictor of the pupil and on the secretory glands was abundantly evident. Neostigmine had no discernible central effect on the nervous system and the electroencephalogram was not altered.

It is suggested that if curare is to be used properly as an adjunct in anesthesia its inability to depress the central nervous system be kept clearly in mind. Its sole action of value in anesthesia is to produce skeletal muscular relaxation by the peripheral paralytic effect on end plates of skeletal muscle cells. It should be employed only as an adjunct with agents capable of relieving pain and obtunding consciousness. Failure to appreciate the limitation of curare may bring this very valuable agent into undeserved disrepute.

MARY FRANCES FOX, M.D.

Dripps, R. D.: The Immediate Decrease in Blood Pressure Seen at the Conclusion of Cyclopropane Anesthesia: 'Cyclopropane Shock.' *Anesthesiology* 1947 8:75.

The etiology of the decrease in blood pressure not infrequently noted at the conclusion of cyclopropane anesthesia has been investigated. The usual sequence of events is as follows:

The blood pressure during anesthesia is elevated above the preoperative level. When the mask is removed both systolic and diastolic pressures decrease the rate and extent of the decline being variable. In those patients showing an immediate and precipitous fall in blood pressure the skin becomes clammy the pulse is of poor volume and emergence delirium is profound. It is in this condition that the term cyclopropane shock has been applied.

Certain facts seemed to fit together to provide a logical explanation for the phenomenon. It has been established that cyclopropane anesthesia is associated with a respiratory acidosis which is ascribed to the accumulation of carbon dioxide. Secondly it is known that sudden cessation of rebreathing is accompanied by a prompt decrease in the blood pressure level the diastolic pressure being decreased more than the systolic. Finally it has been demonstrated that loss of carbon dioxide is often associated with a diminution in blood pressure in the anesthetized man and animal. It is apparent that the buffer mechanisms are sufficiently active to maintain the nervous control of the cardiovascular system unless they are partially or completely inactivated by a depressant drug.

The hypothesis was thus formulated that the rise in blood pressure or the maintenance of circulation under cyclopropane anesthesia was related to carbon dioxide retention secondary to the respiratory depressant action of the drug. When the respiratory depressant was removed at the conclusion of the

anesthesia, an elevated carbon dioxide tension in the arterial blood would diminish and the blood pressure also would fall.

The results of clinical studies give evidence in favor of the hypothesis. The possibility has been considered that other physiological imbalances secondary to the closed system method of administration may be concerned in the postoperative decrease in blood pressure.

Certain practical considerations arise if this theory is proved correct. First, the nature and amount of the preoperative narcotic becomes important. Second, it is apparent that the sequence of events leading up to this postcyclopropane hypotension is more the fault of the anesthetist than the anesthetic. Third, some clinicians have learned to minimize this postcyclopropane decrease in blood pressure by utilizing semi-open techniques with rapid flows of nitrous oxide-oxygen during the last 5 to 15 minutes of a prolonged cyclopropane anesthesia. Fourth, it might be of interest therapeutically to attempt to control this hypotensive reaction by using carbon dioxide inhalations during the period of emergence from anesthesia. Treatment of this condition in the opinion of the authors, consists essentially of its prevention through maintenance of an adequate respiratory exchange.

MARY FRANCES FOX, M.D.

Loech, B. C.: Safety Measures in Anesthetics. *Canad. M. Ass. J.* 1947 56 28.

Explosions and fires have occurred in operating rooms due to the explosibility and inflammability of many of our most useful anesthetic vapors and gases.

Static sparks (more common in a dry atmosphere) form probably the greatest hazard. Common sense and alertness to the hazards are the best safeguards.

Characteristic of all presently available local anesthetic drugs is that an individual overdose produces tonic muscle spasms and possibly full-blown generalized convulsions. An intravenous barbiturate, sufficient to relax the muscles, is considered the best antidote, and may promptly allay the convulsions before the respiratory and heart muscles become affected. Pentothal sodium given intravenously in a 1% or 5 per cent solution is effective. Possibly intravenous curare may prove to be even more effective.

No spinal anesthetic is ever given without frequent blood pressure readings, or without a vasopressor drug at hand, in order that blood pressure may be maintained within reasonably normal levels throughout the operation. A very dilute solution of neosynephrine or methedrine intravenously is used. Adrenalin is avoided because of its reputed danger in association with cyclopropane, which is often used as a supplement.

The strength of pentothal sodium now recommended is 1% per cent for ordinary methods of use for the continuous intravenous drip technique, 0.3 per cent is satisfactory. The author stresses a few specific don'ts for pentothal safety.

Endotracheal intubation is a procedure that every anesthetist must master for such a maneuver has

been lifesaving. Whole blood transfusion should be anticipated and made ready for extensive procedures. Plasma should be constantly on hand both as an emergency substitute for blood and for conditions in which it is particularly indicated. Electrolyte solutions must be in generous supply and ready for immediate use. For long or serious operations, the author feels sure the happiest anesthetist is the one who has an intravenous drip running and his patient intubated, for he is then in a masterful position.

It is thought that curare is among the safety agents of the modern anesthetist's armamentarium, for it is a relatively safe agent which will produce complete muscular relaxation for a short period and can be safely repeated as needed. From the standpoint of safety it should be stated that the sometimes serious laryngospasm, which causes respiratory embarrassment, can be temporarily overcome by the use of curare.

Suction as a safety measure to the anesthetist has a value which can scarcely be overestimated.

Today anesthetists believe that unduly shallow or slow respirations usually need only the mechanical augmentation which can be easily supplied. The patient who has a good pulse, but whose respiratory movements, either by accident or by design, have ceased entirely can be adequately supported by the simple method called controlled respiration.

While falling circulation can usually be dealt with, actual cardiac arrest is quite a different matter and is usually irreversible. The generally advocated emergency measures are reviewed.

A recovery section probably is the best answer to the problem of early postanesthesia care the most dangerous period being that immediately following the patient's return to bed, when adequate supervision may be lacking.

MARY FRANCES FOX, M.D.

Schmidt, E.: Low Spinal Cord Injuries following Spinal Anesthesia. *Acta chir scand.*, 947 95 102.

From the time that spinal anesthesia was first used there have been reports of complications of the nervous system. Following a discussion of the pharmacology of the various spinal anesthetic drugs the author reviews the literature and presents the material which he has collected through questionnaires concerning complications of the central nervous system.

While reviewing this material the author encountered many studies of up to a few thousand cases in which there were no complications. This fact is mentioned as a counterbalance against the alarming series presented. Experimental studies show that tropacocaine, novocain, alypin, and stovaine in certain cases cause definite spinal cord lesions. The disturbances are either reversible or permanent. The injuries are located in the spinal cord and are most marked near the site of injection. Nerve roots and spinal ganglia are spared as a rule.

The author found in the literature reports of meningeal reactions following the use of most all of the local anesthetic agents. The reactions are usually

very mild and transient, and only in exceptional cases does the meningeal irritation reach an alarming degree.

Low lesions of the spinal cord usually manifest themselves through phenomena of irritation or loss of function. The symptoms may appear at once or may become noticeable only after days or months.

The author collected some valuable material as a result of his questionnaire sent to 121 hospitals. It was deduced that the number of spinal anesthetics used per year for the whole country of Sweden may be estimated at between 25,000 and 30,000. During the period from 1943 to 1945 there were 6 definite cases of severe postanesthetic injury—a frequency of about 0.01 per cent. Hypobaric percarine was used much more frequently than novocain, decaline or tropacaine.

The 6 cases of postanesthetic damage of the nervous system are reported in detail. The probable cause of injury to the spinal cord is the chemotoxic effect of the anesthetic. The effect on the myelin is proportional to the strength of the anesthetic solution as well as to the injected volume. Because so few people are affected there may exist a rare individual sensitivity.

In a few cases marked and severe pain appears during the injection of the anesthetic. In the event of severe pain it is strongly recommended that the injection be discontinued and that if possible the operation be postponed.

The advantages of a well given spinal anesthetic are still great and easily counterbalance the small risk of postanesthetic injuries. However according to the author the indications for spinal anesthesia should be more rigid. Another less harmful anesthetic should be substituted whenever possible.

EDITH EASON M.D.

Ballie H. Impending Death under Anesthesia.
Lancet, Lond., 1947: 1, 5.

Experience has taught that cardiac arrest can occur in any patient, with any anesthetic agent and any anesthetist. For obvious reasons, a general emergency surgeon is more often confronted with impending death under anesthesia than is the surgeon engaged in special branches.

Two fundamental conditions are segregated: blue asphyxia (primarily respiratory) and white asphyxia (primarily cardiac). The latter is far more serious. After 30 years' observation, the author has now abandoned expending time in the performance of artificial respiration and the injection of adrenaline into the ventricle. He recommends immediate cardiac massage when the heart stops. The current plan of action includes intermittent compression of the ventricles through the diaphragm within 15 minutes after the stoppage occurs. It appears that the early anxieties and later complications that follow temporary cardiac cessation are proportional to the length of time the organ is functionless.

The time limit for successful cardiac massage is a great deal longer in cases in which the heart has

ceased to beat after blue asphyxia, as the cerebral mechanism is not deprived of blood.

In sudden cases of vasomotor collapse when a pint or more of fluid must be put into circulation in a matter of minutes, injection by syringe (not by gravity) into the bone marrow is a method that has yet to be bettered. This method is advocated by the author for use in desperate crises.

MARY FRANCES POE, M.D.

SURGICAL INSTRUMENTS AND APPARATUS

Wynn S. K., and Macomber D. W.: Practical Points in Wolfe Graft Technique. *Surgery* 1947: 31, 86.

The authors review their experiences in over 100 cases in which they employed a thick graft of this type. Because this graft is more durable, shrinks less, and provides a better color match, they have elected the Wolfe graft whenever the defect has been not too extensive, the recipient area favorable enough, and the best appearance and greatest durability are desirable.

The choice of the donor site is most important when the defect is on the face. It is generally believed that the upper eyelid and postauricular tissues provide the most perfect quality and color matching for small facial defects, and for larger areas the lower neck or clavicular region is superior. The remaining defect is treated with undermining and closure, or by a split skin graft. The inside surface of the upper or lateral thoracic wall provides good quality skin but the color is less favorable.

Thigh skin provides a useful Wolfe graft. It is advocated that donor skin for a defect upon the dorsum of the nose may match much more accurately if a split graft is removed from the donor site and allowed to heal prior to the main operation. This gives the area an orange peel appearance and is especially important if the individual has enlarged pores. Usually 3 weeks following the removal of the thin graft, the full thickness graft can be cut to pattern from this natural appearing donor site.

Since the graft is nourished from the base rather than from the edges, its recipient bed must be clean and vascular. Gentle, firm and constant pressure should be maintained following the removal of stitches and the early dressings, for a period of 3 weeks or more.

It is believed that the Wolfe graft should be cut approximately 20 per cent larger, to allow for inevitable shrinking and to avoid tension at its periphery. The authors prefer to cut a pattern beforehand. When the graft is dissected from its donor site, every morsel of subcutaneous fat is removed from its under surface. In fact a bit of the corium is commonly removed in order to be certain. They stress the use of straight scissors, absolute hemostasis with nonabsorbable suture, the use of adrenalin solution locally and suturing with interrupted material. They favor pressure dressings with a pattern tied in place by sutures and covered by a large dressing if possible.

In considering eyebrow grafts they feel that the scalp graft for making an eyebrow is an exception to the rule that the free graft is utterly dependent upon its base, rather than its edges, for nutrition. Two or three long narrow grafts, placed side by side at intervals of 10 days or more result in survival of more hairs, especially if the knife blade is inserted into the donor area and drawn parallel to the hair shafts while taking the graft. It is a familiar fact that the hair or hair roots within the graft at the time of transfer usually are shed. Then a certain per cent of the follicles survive and produce new hair. It is noted that often more hairs survive near the borders of the graft and a higher percentage survive in a slender graft than in a wide one. Knowing that bold thinning on the deep side of this graft destroys many hair follicle bulbs, they find that less bold thinning and a narrower graft begets a greater per cent of viable follicles. These observations indicate that substantial nutrient reaches the graft from its side.

The postoperative care is meticulous. Face grafts are not dressed for 5 days unless necessary and the stitches are removed at that time. Elsewhere the dressing may be left undisturbed for 10 days or so. The mold made at the original operation is replaced

and pressure maintained for 3 to 4 weeks, until most of the shrinking has stopped and the graft is beginning to assume a natural color. By the end of 6 to 8 weeks, it is frequently possible to evaluate the success of the original grafting procedure and plan any corrective procedures.

Complications which may be noted at initial dressing, and a method of treating them are as follows:

1. Blebs on the graft. These should be opened, fluid expressed, and 20% mercurochrome applied.

2. Separation of the suture line. This should be reapproximated by strips of flamed adhesive.

3. Hematomas under the graft. If at the edge it is evacuated by simple expression and the edge reapproximated by adhesive. If not at the edge, it is best evacuated by a stab wound.

4. Serum under the graft. This is treated the same as hematomas.

5. Areas of necrosis. It is best to await separation, then remove by small scissors, and dress with a single ply fine mesh scarlet red gauze, over which the usual pressure dressing is reapplied.

6. A remote, unpredictable, and uncontrollable complication in some cases is pigmentation of the graft.

LEROY J. KILGORE, M.D.

PHYSICOCHEMICAL METHODS IN SURGERY

ROENTGENOLOGY

Robbins, L. L. The Technique of Roentgenological Demonstration of Pulmonary Infarct. *Am J Roentg* 1946, 56 736

Contrary to experience elsewhere, pulmonary infarction constitutes one of the two most common postoperative complications at the Massachusetts General Hospital, Boston

Since pulmonary infarction often is the first sign of an impending massive fatal embolism, and in view of the fact that certain preventive measures are now available, an early roentgen demonstration of such a complication is important.

The author describes a technique of roentgen examination which permits an early diagnosis of pulmonary infarct. Unless the patient's condition forbids the examination is started by roentgenoscopy. This is done with a high kilovoltage approximately 85 to 89 kilovolts, and a low milliamperage, to save the skin from overexposure. After the infarct is located spot roentgenograms, similar to those of the gastrointestinal tract, are taken in at least two different projections with the same kilovoltage and a very short exposure. A posteroanterior roentgenogram is always advisable and if spot films cannot be made, lateral and oblique roentgenograms are of additional value.

If a patient is too ill for roentgenoscopy a ceiling floor mounted tube stand is of great value. The bed with the patient is pushed beneath this tube and a roentgenogram is made at 6 foot distance. Such a procedure is much better than a portable examination in the patient's sick room. The technique of exposure is along the same lines as for the spot films. A rotating anode, which provides a small focal spot is used with high milliamperage and short exposure. Merrill worked out a modification of Fuchs' technique establishing optimum kilovoltage for the part to be examined and variation of milliamperage-seconds with the size of the patient. The factors are expressed in the following table

TABLE I.—CHEST EXAMINATION

Fluor Chest	300 mA.		7 in. distance			
	Posteroanterior		Oblique		Lateral	
	CR.	SEC.	CR.	SEC.	CR.	SEC.
Small	9	1/50	3	1/50	16	1/5
Average	10-15	1/30	3-3.5	1/5	17-18	0/10
Large	15-20	1/20	3-3.5	1/5	18-	1/1
Range	30-	1/5				
	66 kv		75 kv		80 kv	

Roentgenograms taken with this technique are steel gray showing poor contrast but of distinct value

in diagnosing infarct. Bronchograms and laminograms have proven of little or no value

Differential diagnosis includes bronchopneumonia, metastatic malignancy and during the healing stage of the infarct linear shadows of atelectasis. If the infarction has produced a diminution in the size of the affected lobe the possibility of a primary carcinoma of the lung must also be considered

T LUCOTIA M.D.

Lindgren E. Roentgen Diagnosis of Arteriovenous Aneurysm of the Lung *Acta radiol.*, Stockh. 1946 27 585

For practical purposes, the term arteriovenous communications is used to include arteriovenous aneurysm cirroid aneurysm pulsating angiomas, and simple angiomas. The symptoms of these lesions are generally circulatory and local and they depend on the location of the abnormality. Central lesions generally lead to cardiac manifestations or sudden death. Peripheral lesions result in a gradual enlargement of the heart and dilation of the involved artery.

Three cases of arteriovenous aneurysm of the lung are reported. Two of these cases were diagnosed before operation surgery was not performed in the third case. The clinical findings were cyanosis clubbing of the fingers dyspnea sensations of weight or pain in the chest and hemoptysis.

The anatomopathological findings in arteriovenous aneurysm are classical in that the distended afferent artery and distended efferent veins are clearly seen. There is either a direct communication to one or several larger vessel trunks or a tangle of more or less distended vessels rather than capillaries. As the arterial pressure is transmitted to the malformed vessels and into the veins, these become increasingly dilated. Degenerative changes take place in the walls and eventually some of the vessels rupture. In time new pathological communications will be produced.

Roentgen findings reveal a broad band shaped density which is connected with the hilar vessels. In the periphery the latter communicate with one another. The vascular formations are more or less rounded and resemble tumors. The vessels lie in different planes this is best demonstrated in the lateral view or by fluoroscopy. The arteries are less distended than the veins and the aneurysm is most distended of all. Larger aneurysms may simulate tumors. Arteriovenous aneurysm communicates with the hilus and decreases in size with the Valsalva maneuver (forced expiration with the closed glottis). The Muller test increases the size of the aneurysm. In some instances it is necessary to distinguish an arteriovenous aneurysm from a tuberculous process other inflammations atelectasis and infarct. Calcification in the aneurysm was not observed by the author. Pulsation had been observed at the time of operation although not at the time of fluoroscopy.

Valuable adjuncts to the routine fluoroscopic roentgenographic studies are contrast visualization and laminagraphy. The author is of the opinion that the congenital arteriovenous communications do not give rise to cardiac enlargement.

MAURICE D. SACKS, M.D.

Ramos, A. G. P., Guitarte, A. I., and Bianchi, A. A.: Peritoneal Pneumoradiography in Gynecology (La neumoradiografía peritoneal en ginecología). *Bol. Soc. obst. gín. B. Aires* 946 25 196.

In gynecological problems, when circumstances prevent careful and complete diagnostic examination, peritoneal pneumoradiography is most helpful. It is a relatively simple procedure, causes a minimum of discomfort, and is free from major complications. It gives a good pelvic panorama.

This article gives the technique used by the authors and presents the case reports of 10 peritoneal pneumoradiographies and 5 hysterosalpingographies in combination with the pneumoradiographies.

Carbon dioxide was employed because it does not resorb as rapidly as oxygen or air.

Illustrations demonstrating the appearance of pathological conditions such as ovarian cysts, hydromyxoma, the pregnant uterus, as well as normal pelvic structures, are presented.

The authors consider the procedure definitive, and an extremely useful diagnostic adjunct in difficult gynecologic cases.

STEFANO A. ZIMMAN, M.D.

Belgrano V and Gardella, G.: Para-Articular Ossifications (Ossificazioni para-articolari). *Radiol. med. Milano*, 946, 31 43.

Twenty-three cases of post-traumatic para-articular ossification and 1 case following a medullary lesion with resulting paraplegia are reported by the authors. Four patients were younger than 30 years and among them was 1 boy 5 years old. The authors believe that according to the literature this was the youngest patient on record in whom a post-traumatic para-articular ossification occurred.

The ratio of contusions, dislocations, and fractures followed by ossification was 3 to 7 to 8.

In 4 cases the ossified tissue was removed and in 3 of them the macroscopic examination and histologic studies demonstrated a close relationship to the articular capsule which undoubtedly served as a source of bone formation. Post-traumatic para-articular ossification may be caused by a metaplasia of periosteum, ligaments, articular capsule, or other para-articular tissues. Such processes are stimulated by forced mobilization of the rigid articulation, passive movements, and rough massage.

Several conditions must be considered in the differential diagnosis. Para-articular ossification shows a trabecular structure in roentgenograms while calcifications cast a homogeneous shadow. Pictures taken in various directions may detect an origin from the bone suggestive of a hypertrophic callus, an osteosarcoma, or an exostosis. Para-articular ossification or so-called Pellegrini-Stieda's disease affects the el-

bow chiefly. Clinical symptoms may be absent, a calcareous or osseous structure is demonstrable, the condition is usually stationary, and the site of the changes is usually an articular ligament.

On the other hand regressive calcareous periartthritis, or Duplay's disease, is usually located in the shoulder region and creates a well defined clinical picture. The structure of the pathologic formations is amorphous, roentgenologically a rapid regression of the process may be demonstrated and the changes are located in the serous bursae in the insertion of tendons, and in para-articular tissues. Trauma cannot always be found in the history contrary to the findings in para-articular ossification.

The process reaches the "stage of maturity" when the roentgenographic shadow has sharp outlines and the density remains unchanged in pictures taken at certain intervals.

In 15 of 23 cases observed by the authors the condition was located in the elbow; in 5 in the knee; in 1 in the scapulohumeral articulation and in 1 case, at the ankle articulation. Only 1 patient belonged to the female sex. In 1 patient with a fracture of the ninth and tenth dorsal vertebrae followed by paraplegia, the roentgenograms disclosed para-articular ossifications in the paratrochanteric regions of both femurs and both knees.

Traumatic, chemical, and toxic factors have been attributed to para-articular ossification. Among the chemical factors, the decalcification of bone plays the main role. Patients with paraplegia usually suffer from an atony of the digestive tract with a resulting increase of the bacterial flora and absorption of endotoxic products. Hypercalcemia combined with trauma and such toxic products may cause the formation of new bone. Mechanical irritation of the edematous tissues has been accepted as a responsible factor by Freund.

Prophylaxis consists of gentle reduction of dislocations under deep anesthesia. The after treatment should consist of a gentle, nontraumatizing massage. Similar principles should be followed in the treatment of fractures. An infiltration of the affected ligaments with novocain, repeated whenever necessary is indicated in order to eliminate stimulation of hypertemia, organization of connective tissue, rarefaction of epiphyses and hypercalcemia. Anesthesia diminishes pains and allows early motions. Immediate immobilization of the injured limbs excludes irritation, alleviates pain, and accelerates absorption of extravasated blood. Slight compression for the same purpose is desirable. Diathermy improves the local circulation and accelerates absorption of the hematoma. X-ray therapy diminishes the tendency toward ossification but only in early stages.

As a rule, the "stage of maturity" is reached within 6 to 12 months after the injury. Surgical treatment is indicated not before this stage has been reached and only if limitation of motions is present and conservative therapy consisting of diathermy, gentle massage, and active mobilization has failed.

JOSEPH K. NARAY, M.D.

Cade Sir S., Scarff R. W., Golding, F. C., and Adams, S. B.: Discussion on Primary Malignant Tumors of Bone (Symposium) *Brit J Radiol.*, 1947 20 10

Cade has suggested the following simple grouping for the classification of bone sarcoma. The percent age, sites of origin and the radiographic findings are included

Osteogenic sarcoma (50%) Metaphysis rarefaction, sclerosis new bone formation, Codman's triangle and sunray spicules

Ewing's tumor (15%) Diaphysis sclerosis of cortex and medulla, onion peel new bone and patchy rarefaction

Multiple myeloma (30%) Medulla of diaphysis bone destruction no compensatory new bone formation

Parosteal sarcoma (15%) Diaphysis erosion from outside, osteolysis irregular calcification in soft tissue

To this group is added a fifth type which is nearly always benign in its clinical course

Osteoclastoma (20%) Epiphysis expansion and thinning of cortex, trabeculation no new bone formation

The balance between bone destruction and bone formation and the direction of the spread of tumor cells explain the variation in the x ray appearance. Sunray spicules are not always diagnostic of osteogenic sarcoma, nor are the onion peel layers an infallible sign of Ewing's tumor. These changes may be produced by nonmalignant lesions

Ewing's tumor is believed to be the most radio-sensitive type and parosteal sarcoma is believed to be the least sensitive type. Osteogenic sarcoma varies. Some sarcomas of this type are very sensitive others are resistant. Adequate irradiation may produce all or none of the following effects: progressive shrinkage of the tumor, recalcification of osteolytic lesions, resorption of abnormal bone, healing of pathological lesions, restoration of normal bone contour and histological evidence of arrest of neoplastic growth. These changes however are not permanent. Local recurrences are the rule rather than the exception.

Preoperative irradiation is always given in cases of osteogenic sarcoma. If the response is satisfactory amputation is postponed if no response is noted the irradiation is thought to have sufficiently inhibited the activity of the tumor so that the delay has in no way altered adversely the patient's life expectancy. I. M. Alchin, at Westminster Hospital, uses these factors: 200 kilovolts 2 mm. copper plus 1 mm. aluminum filter 300 roentgen divided daily tumor dose in a total average time of 5 weeks and total tumor dose of 3,000 roentgens

Ewing's tumor usually responds rapidly, though permanent regression is seldom achieved. Local recurrences are unusual if adequate irradiation has been given. Multiple metastases are the common final manifestation. In the absence of metastasis local recurrence is an indication for amputation.

Multiple myeloma is invariably fatal. Irradiation in small doses is the best palliative procedure for the relief of pain

Parosteal sarcoma is radioresistant. Surgical treatment is the method of choice. Postoperative irradiation to the stump is of value

Osteoclastoma may be treated by conservative surgery or by irradiation. Surgery is preferred (1) in young children when the tumor is in close proximity to the epiphyseal line (2) in tumors of moderate extent when the destruction of bone is limited and the cavity which is left by curetting is small (3) in tumors of the digits and (4) when the tumor has extended to the neighboring joint and irradiation will have to include articular and periarticular structures. Irradiation is indicated (1) in healthy adults (2) in all patients when the tumor is difficult of access and (3) in accessible tumors when the destruction of bone is great and pathological fracture is likely to follow curetting. The combination of curettement and irradiation is not advisable. Irradiation of postoperative recurrences is less successful than primary irradiation. The x ray therapy factors include 200 kilovolts 1.5 mm. of copper and 1 mm. aluminum filter. The daily skin dose for adults is 200 roentgens and for children 150 roentgens in an average time of 4 weeks. The total tumor dose for adults is 2,000 roentgens and for children, 1,200 roentgens. A second series of treatment is given after a period of 6 months and a third series after 18 months.

The role played by a single injury in the production of malignant disease has been largely abandoned. However Scarff states that there remains considerable evidence in favor of trauma as an etiological factor in sarcoma of bone, and angioendothelioma.

Although much has been written against the principle of biopsy, there is no real evidence to show an increased liability to metastasis following such a procedure. Histology is of great importance not only in diagnosis but also in the prognosis and treatment. Since the evidence against such a procedure is largely one of impression it is believed that the advantages leave no choice in the matter. In fact it is no more dangerous than palpation.

Scarff's classification of bone tumors omits parosteal sarcoma per se, as well as osteoclastoma, but includes infiltrating chondroma, extraperiosteal fibrosarcoma, medullary fibrosarcoma, angioendothelioma, and chordoma.

While most neoplastic lesions show some correlation between the histology and the subsequent behavior of the tumor, osteogenic sarcoma has thus far failed to behave in such a fashion. Some highly differentiated lesions showing rapid growth appear to have been completely eradicated by amputation while slow growing well differentiated lesions show no response either to surgery or x ray therapy. Periosteal fibrosarcoma and medullary fibrosarcoma offer a somewhat better prognosis than osteogenic sarcoma, hence should be classified separately.

The roentgen diagnosis of bone tumors is fraught with difficulties. Since the average roentgenologist

cannot hope to have a large personal experience, he must rely upon the literature. Goulding does not believe the latter to be too reliable. For example, giant cell tumors are supposed to originate in the epiphysis, yet he has never seen this tumor in the epiphyseal end of the bone until after the epiphyseal line has closed. In adolescents before closure of the epiphysis these tumors are found in the metaphysis. Moreover some giant-cell tumors bear a close resemblance to central osteolytic lesions such as cysts, medullary sarcoma, fibrosarcoma and, to a less extent, chondroma, fibroma, plasma-cell myeloma, and even adamantinoma. Many of these supposedly "trabeculated" tumors have no trabeculations. From the roentgenologist's viewpoint at least a period of observation and the clinical course of the lesions is often the only true indication of its nature. Almost all of the progress which may be made in exact diagnosis of the lesion is dependent upon the pathologist.

Adams has reported 4 cases of osteogenic sarcoma in which both pre- and postirradiation biopsies were performed. Diminution in the size of the tumor and histological evidence of radiosensitivity were shown in all 4 cases. Radiosensitivity was manifested by a marked relative absence of mitotic figures, many swollen nuclei and a greatly increased number of giant cells. Relief of pain is a most gratifying accompaniment of the irradiation. The swelling in cases of osteogenic sarcoma regresses much more slowly than in Ewing's tumor. R. B. LEWIS, M.D.

MISCELLANEOUS

Mitchell J. S.: Applications of Recent Advances in Nuclear Physics to Medicine. *Brit. J. Radiol.* 1946, 19, 481.

Recent advances in nuclear physics which led to development of the atomic bomb also provide a method for preparation of large amounts of radioactive isotopes. These should be used in medicine as follows: (1) Radioactive tracers in the study of metabolic processes, pharmacology, and therapeutics; (2) radiation therapy; (3) selectivity of certain isotopes for particular cells and tissues to serve as a therapeutic agent.

The "pile" serves as the source of radioactive isotopes. Tracers will undoubtedly lead to new developments in all branches of medicine. The isotopes used should have a reasonable half-life period. Concentration of the isotopes should not be too high. Phosphorus 32 and carbon 14 are two of the many isotopes being studied.

The pile may also serve as a source of gamma radiation in radiotherapy. Radiocobalt 60 with a half-life of 5.3 years and tantalum 185 with a half-life of 97 days are some of the isotopes being considered as a source of therapy.

Some isotopes have a selective concentration for certain tissues and may be used as a therapeutic agent. Phosphorus 32 has been used effectively in the treatment of leucemia, lymphosarcoma and polycythemia. Iodine 131 is used in thyroid diseases.

The cyclotron produces isotopes too, but in smaller numbers. However with the cyclotron it is possible to prepare radioactive isotopes in a state of high concentration. Cyclotron has the advantage over the "pile" in being able to prepare substances such as sodium 22 and iron 55. In some instances in which the isotope has a short half-life or the quantity desired is small it is more practicable to use the cyclotron.

The pile has the advantage of either being able to produce isotopes in large quantity or small amounts in high concentration. Then, too, fission products, such as iodine 131 can be used in radiation therapy. The "pile" cannot compete with the cyclotron as a source of fast neutrons whose high energies are used in the treatment of deep-seated malignancy. For practical purposes the "pile" has the following disadvantages: It is difficult to position patients; it is isolated; it produces whole body radiation which is a problem to control; and it is difficult to collimate the beam. MAURICE D. SACRE, M.D.

Hertz, S. and Roberts, A.: Radioactive Iodine in the Study of Thyroid Physiology. The Use of Radioactive Iodine Therapy in Graves Disease. *Ill. J. Surg.* 1946, 54, 474.

The authors' article is the seventh of a series. In the previously published 6 articles, they dealt with tracer studies of radioactive iodine in animal and human thyroid physiology and iodine metabolism. The present article is a 3 to 5 year follow-up report of a group of 39 patients with Graves' disease who were treated by internal irradiation with radioactive iodine.

The samples of radioactive iodine were obtained by deuterium bombardment of tellurium in the cyclotron. Over 90 per cent of the activity consisted of the 126 hour I^{131} and most of the remainder of the eight day I^{132} .

The dose, which was administered orally in the form of sodium iodide and without any preliminary iodine restriction, varied between 0.7 and 18 millicuries. In 19 cases a single dose, and in 20 cases multiple divided doses were given. In order to insure maximum collection in the thyroid the total iodide administered was kept below 5 milligrams of iodine.

It was found early that the maximum excretion of the radioiodine occurred in the urine during the first 72 hours. A quantitative determination of the radioactive iodine content of the carefully collected (iced and cooled) urine, therefore, gave an indirect estimate of the thyroid retention of the radioactive iodine. In a few cases external gamma ray counter measurements were also made.

The administration of the radioactive iodine was followed within from 1 day to several weeks by routine iodination of the patients with a saturated solution of potassium iodide given in doses of minima twice a day. This was continued, as a rule, for a period of 3 to 4 months until an essentially normal basal metabolic rate was obtained. A rise of the basal metabolic rate upon cessation of the iodination was considered as failure of the radioactive iodine therapy.

An attempt was made to express the radiation dose in the equivalent roentgen unit by applying the following formula

$$\text{Radiation (in roentgen units)} = \frac{10,000 \text{ (Dose of } I^{131} \text{ in mc) (fractional uptake in thyroid)}}{\text{weight of thyroid in grams}}$$

For I^{131} the constant 10,000 is replaced by 117,000. Thus, for I^{131} a net collection of 3 millicuries in a thyroid of 30 grams weight will give a total of 1,000 roentgens in decaying to zero. The initial rate of such irradiation is 55 roentgens per hour. For I^{131} it is only 3.6 per hour. However, an error of 50 per cent or more may be expected.

The results obtained in all 29 cases are summarized in tables. The treatment was considered a failure in 9 cases; the remaining 20 patients were apparently cured. Of the failures, 5 patients were subsequently operated upon and all developed postoperative hypometabolism.

The following clinical considerations are important (1) there should be no previous iodine therapy or if such therapy has already been undertaken it should be stopped for a period of at least 1 month to allow maximum uptake of the radioactive iodine (2) availability for close follow-up (3) routine iodization starting from 1 to 3 days after the administration of the radioactive iodine and (4) large goiter with secondary involuntal changes should be submitted to surgery on a purely mechanical basis.

In patients receiving radioactive iodine therapy, a short period of hospitalization is necessary for the usual preliminary clinical studies and the administration of the isotope. After that the patient is fully iodinated and released to be followed up as an ambulatory case.

The conclusion is drawn that radioactive iodine when given in doses of 5 to 25 millicuries to uniodinated patients with Graves' disease possessing goiters of 60 to 75 milligrams, produces a cure in about 80 per cent of the cases.

T. LEVITT, M.D.

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R. B. Lewis, M.D.

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M. Urick D. Swann, M.D.

Hertz, S., and Roberts, A.: Radioactive Iodine in the Study of Thyroid Physiology. The Use of Radioactive Iodine Therapy in Graves' Disease. *West. J. Surg.* 94 6 474.

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M. C. D. Sachs, M.D.

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The authors' article is the seventh of a series. In the previously published 6 articles they dealt with tracer studies of radioactive iodine in animal and human thyroid physiology and iodine metabolism. The present article is a 5 to 5 year follow-up report of a group of 29 patients with Graves' disease who were treated by internal irradiation with radioactive iodine.

The samples of radioactive iodine were obtained by deuterium bombardment of tellurium in the cyclotron. Over 90 per cent of the activity consisted of the 126 hour I^{131} and most of the remainder of the eight day I^{130} .

The dose which was administered orally in the form of sodium iodide and without any preliminary iodination varied between 0.7 and 38 milligrams. In 19 cases a single dose, and in 10 cases multiple divided doses were given. In order to insure maximum collection in the thyroid the total iodide administered was kept below a milligram of iodine.

It was found early that the maximum excretion of the radioactive iodine occurred in the urine during the first 72 hours. A quantitative determination of the radioactive iodine content of the carefully collected (iced and corked) urine therefore gave an indirect estimate of the thyroid retention of the radioactive iodine. In a few cases, external gamma ray counter measurements were also made.

The administration of the radioactive iodine was followed within from 1 day to several weeks by routine iodination of the patients with a saturated solution of potassium iodide given in doses of minims twice a day. This was continued, as a rule, for a period of 3 to 4 months until an essentially normal basal metabolic rate was obtained. A rise of the basal metabolic rate upon cessation of the iodination was considered as failure of the radioactive iodine therapy.

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An attempt was made to express the radiation dose in the equivalent roentgen unit by applying the following formula

$$\text{Radiation (in roentgen units)} = \frac{10,000 \text{ (Dose of } I^{131} \text{ in mCi) (fractional uptake in thyroid)}}{\text{weight of thyroid in grams.}}$$

For I^{131} the constant 10,000 is replaced by 117,000. Thus for I^{131} a net collection of 3 millicuries in a thyroid of 30 grams weight will give a total of 1,000 roentgens in decaying to zero. The initial rate of such irradiation is 55 roentgens per hour. For I^{131} it is only 3.6 per hour. However an error of 50 per cent or more may be expected.

The results obtained in all 29 cases are summarized in tables. The treatment was considered a failure in 9 cases; the remaining 20 patients were apparently cured. Of the failures 5 patients were subsequently operated upon and all developed postoperative hypoparathyroidism.

The following clinical considerations are important: (1) there should be no previous iodine therapy or if such therapy has already been undertaken it should be stopped for a period of at least 1 month to allow maximum uptake of the radioactive iodine. (2) availability for close follow-up. (3) routine iodination starting from 1 to 3 days after the administration of the radioactive iodine and (4) large goiter with secondary involutonal changes should be submitted to surgery on a purely mechanical basis.

In patients receiving radioactive iodine therapy, a short period of hospitalization is necessary for the usual preliminary clinical studies and the administration of the isotope. After that the patient is fully iodinated and released to be followed up as an ambulatory case.

The conclusion is drawn that radioactive iodine when given in doses of 5 to 25 millicuries to uninodularized patients with Graves disease produces a cure in about 80 per cent of the cases.

T. LECUTTA, M.D.

MISCELLANEOUS

CLINICAL ENTITIES—GENERAL PHYSIOLOGICAL CONDITIONS

Cameron G. R.: Sudden Shifts of Body Fluids.
Proc. R. Soc. M. Lond. 1946 40

When a highly irritant liquid such as lewisite or mustard gas is dropped on the skin, a blister forms in a few hours as a result of the localized outpouring of blood plasma from the vessels of the affected part, detaching the avascular epidermis from the underlying vascular dermis. Previous investigations suggested that damage to the skin liberated proteolytic enzymes which were responsible for loosening of the basement membrane.

Such injury also produces a systemic circulatory upset, manifested by a decline in the plasma volume as estimated by photometric methods. If this state is sufficiently severe, death from 'shock' may ensue. Other associated changes are a rise in hemoglobin percentage, red cell count, and packed cell volume (hematocrit per cent) indicating a concentration of blood. The plasma-like fluid collects in the irritated tissues and produces an edema. The diminished circulating plasma volume and plasma proteins result in a functional renal upset with a consequent elevation of the blood urea level. A mild secondary anemia, as a rule, also occurs.

Irritating gases, such as phosgene, lewisite, and mustard vapor when inhaled, present a picture of local fluid loss similar to that described above. This results in pulmonary edema with acute mechanical asphyxia. Phosgene as such is not absorbed into the blood and therefore does not lead to serious systemic complications through its inherent chemical properties. Thermal burning produces the same disturbance in a more rapid manner as does the subcutaneous injection of large amounts of a hypertonic solution of glucose or saline. Thus, no matter how it is induced, acute anhydremia leads to the picture described above.

By cannulating the lymphatics of the involved area, and by determining the thoracic duct flow, it was found that some of the lost fluid and protein is returned to the circulation by way of the lymphatics. This form of compensation is of limited value and may even be deleterious by introducing harmful chemicals into the blood stream.

The rapid appearance in the injured tissues of a fluid rich in proteins signifies that the filtration membrane (capillary wall) had let through these large molecules in a quite unusual fashion. This was corroborated by experiments showing that after the application of lewisite or mustard gas to the skin, the capillaries become more permeable to a dye such as T 1824 which combines with plasma albumin.

The author believes that Menkin's leukotaxin and the histaminelike substance of Lewis, produced in tissues damaged by mustard gas, are no doubt the intermediaries bringing about the capillary wall

change which underlies increased permeability for plasma proteins. Anoxia increases the permeability of capillaries, as shown by Landis and Drinker.

Whether the alteration is a physical or chemical one in the surface membrane of the living endothelial cells of the vessels, or a loosening of the cement substance which binds together these cells, and whether living processes are concerned is all conjecture. The remarkable studies of Peters and Dixon on enzyme chemistry and chemical warfare agents have opened up a new way of approach to the permeability problem which may bring the solution.

DAVID H. LYNN, M.D.

Melman, E. P.: Concerning the Erythric Form of Traumatic Shock. *Fractures* Dec. 1946, No. 9, 643.

Experimental work on induced shock in animals and the many observations of injury on the field of battle have enabled the author to differentiate two different manifestations of primary shock: the erythric and the torpid forms. The injured man with the erythric form of primary shock is excited and pale, and he complains of the discomfort of his position and the pain in his wound. Nevertheless, despite hinge wounds of the organs he struggles to get up from the litter on which he has been placed and continuously beseeches the attendants to bring him to the dressing stations or to evacuate him further to the rear. Some of these patients refuse the help of the hospital corps and come by themselves for treatment. At the dressing station the discrepancy between the severity of the wound and the comparatively satisfactory general condition of the patient is at once noted. The pulse is of good quality and normal rhythm, and the blood pressure is good. Because of this the patient may be misjudged and denied the antishock measures which may save his life.

The author believes that this form of shock occurs more often than is generally admitted, since most of the observations come from the divisional hospitals where the wounded are received relatively late after receiving the injury. He stresses the need for the military doctor to pay more attention to this form of manifestation in order that the patient receives the necessary antishock treatment before the irreversible changes occur in the vital centers which will bring on the torpid form of shock manifestation and end in death.

A remarkable instance is cited of a soldier wounded in the abdomen by shell splinters, with prolapse of the intestines through the anterior abdominal wall, who refused the help of the sanitary corps, swam the river separating the two lines of battle and replacing his water soaked intestines, ran along under cover of the river bank, avoiding everyone he met until he reached, on foot, the divisional headquarters. There he kept righting himself to a sitting posture on the fit

ter on which he was placed and with glittering eyes, pale face and dry tongue kept close watch on the doctors, refusing operation until suddenly he sank back half unconscious with cold sweat, cyanosis of the visible mucosa and falling blood pressure and rising pulse. Blood transfusion, intravenous fluids, morphine, camphor and caffeine improved his condition and immediate midline laparotomy under local anesthesia, with removal of huge quantities of bloody fluids, metallic splinters with parts of bullet casings, and some entire percussion caps (the shell splinter had struck the patient's bullet pouch) with suture of the numerous holes in the small intestinal loops and in the sigmoid colon was carried out. Before the abdomen was closed streptocidal albumin powder was applied and 750 c.c. of conserved blood was given by transfusion. Following the operation the patient slept for 10 hours.

The postoperative ileus was combated by gastric lavage, syphonoclysis, glucose infusions, and calcium, sodium chloride, and urotropin. During the 10 day period of recovery more than 40 liters of normal saline solution and 0.8 per cent streptocidal solution were given. After 17 days at the field hospital the patient was evacuated to the rear in good condition and a month later he was reported as completely healed and in good health.

JOHN W. BRENNAN, M.D.

Hessner H. The Operation as Trauma. Reflections Concerning the So-Called Postoperative Illness (Die Operation als Trauma. Untersuchungen ueber das Wesen der sog. Postoperativen Krankheit). *Helvet. chir. acta*, 1946 13 167.

The author reviews the so-called postoperative illness which was first described as an entity by Leriche in 1933. He reviews all of the effects of an operative intervention on the various systems of the body economy, the symptoms of these effects and the cause as well as the possible correction of these effects. In considering these he calls attention to the various effects the operation may have upon pre-existing diseases of these organs as, for example, the effect of operations upon patients who have coronary heart disease, absolute or relative. On the other hand he also calls attention to the effects of the operative procedure upon the normal system.

The effects are mediated both through the vegetative nervous system and through changes in the metabolic and chemical processes caused by the operative intervention and anesthetic. Both psychic and physical trauma are active in the usual operative procedure so that all of the factors active in a traumatic experience are also existent in a planned surgical procedure. The author calls attention to the fact that the shock state which follows trauma is identical with that following a planned operative intervention. The difference lies in the fact that, in the latter case, the surgeon has the opportunity of studying all of the factors productive of traumatic shock and thus may be able to either obviate or at least, to minimize them.

The complete study of the patient and the planning of the operative procedure, not alone as an attack upon an organ but as an approach to a generalized disturbed physiology should obviate the so-called postoperative illness. The evaluation of all of the patient's reactions, the status of the function of the various bodily systems and the carefully planned anesthetic sequence are prerequisites for this. A thorough study of the status of all of the body's chemical balance and a knowledge of the effects of the surgical operation should almost completely outline the care which will be needed. Thus a study of the body fluids, electrolytes, and proteins, as well as of the red blood cells is important and measures for their replacement should be at hand in any well planned intervention. The evaluation of the cardiac status, the renal status, and the supply of adequate amounts of oxygen is recommended by the author.

WILLIAM C. BECK, M.D.

Hamilton T. R., and Angevine, D. M.: Fatal Pulmonary Embolism in 100 Battle Casualties. *Mil. Surgeon* 1946 99 450.

A survey was made of 1,065 autopsies on cases in which battle wounds had recently been sustained. It was found that in 66 or 6.19 per cent of these, death was due to pulmonary embolism.

A possible value of an analysis of battle casualties is the absence of such usually plaguing variables as age and previous or intercurrent disease since all of the patients have presumably been physically fit soldiers.

When an individual is lying on his back the increased compression of the left iliac vein by the arterial trunk (right iliac, middle sacral, and left hypogastric arteries) has a direct influence in slowing up the blood stream and explains the well known frequency of thrombosis in the left lower limb.

One hundred cases of fatal pulmonary embolism in battle casualties are reported.

Venous stasis, caused most frequently by immobilization, appears to be the most important factor in the production of phlebotrombosis.

Pulmonary infarcts were located predominantly on the right side and in the lower lobes.

The prevalence of venous thrombosis on the left side of the body did not have a direct relationship to trauma which occurred more frequently on the right side.

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JOSEPH GASTEN, M.D.

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Though the milk factor is known to exist by reason of its influence, it has not been isolated and its nature is totally unknown.

Likewise estrogen production assay techniques permitting the required measurements for this influence are nonexistent.

There are differences in the response of different strains of mice—in their susceptibility to mammary tumors in their response to the milk factor and in their response to hormonal stimulation.

Alteration of genetic constitution will apparently eliminate the milk factor influence producing mammary tumor alter the mammary tumor incidence manifested through hormonal stimulation, and result in differences in susceptibility of mammary tissue to tumor formation.

Statistical evidence suggesting genic control of these influences is presented.

Since (1) there is no direct yardstick against which each influence can be measured independently of others, and (2) individual gene pattern alterations associated with changes of the influences are not mapped, direct proof of gene control over these action paths is not now possible. FRANK B. QUEEN, M.D.

Shimkin M. B., Wyman, R. S., and Andervont B.: Mammary Tumors in Mice following Transplantation of Mammary Tissues. *J. Nat. Cancer Inst.*, 1946, 7 77

Young male C3H strain mice freed of the milk agent were transplanted with mammary tissue from C3H virgin females not freed of the milk agent, and a cholesterol pellet containing 0.4 mgm. (100%) of diethylstilbestrol subcutaneously implanted to furnish adequate estrogenic stimulation for mammary tissue development.

In 90.4 per cent of the 67 mice surviving 8 months or longer mammary tumors developed. Only one of these arose at the site of the mammary transplant.

Thus an attempt to develop tumors in transplanted mammary tissue in mice failed, but a number of interesting implications were elicited.

It is postulated that sufficient milk factor was carried over in the transplant to cause the incidence of tumors to increase from the theoretically calculated expected normal of 3.5 per cent to 50 per cent incidence. C3H male mice not lacking the milk factor under the conditions of the experiments would be expected to develop 73 per cent tumor incidence.

There is no explanation for the failure of development of carcinoma in the transplanted mammary tissues (which in all cases survived).

FRANK B. QUEEN, M.D.

Shimkin M. B., and Wyman, R. S.: Mammary Tumors in Male Mice Implanted with Estrogen-Cholesterol Pellets. *J. Nat. Cancer Inst.* 1946, 7 71

The relationship between the dose of three estrogens, diethylstilbestrol, estradiol, and triphenylethylene, under conditions of continuous absorption and mammary tumor response in male mice of C3H strain is reported.

Cholesterol pellets containing a concentration of 0.5 to 30 per cent of diethylstilbestrol, 1 to 50 per cent

estradiol, and 10 to 50 per cent of triphenylethylene were subcutaneously implanted into one month old mice. Approximately 30 to 40 mice were used for each series (total, 461). The mice were observed usually until tumors developed, or until natural death. No tumors developed in mice receiving triphenylethylene.

From 2.5 to 86.6 per cent of mice subjected to the continuous influence of diethylstilbestrol developed tumors in from 16.8 months average time with the lower dose, to 6.0 months with the highest dose. With estradiol, from 3.5 to 77.3 per cent developed tumors, the time range varying from 0.3 months with the smaller doses to 5.9 months with higher doses. Thus there is a correlation between the concentrations of both diethylstilbestrol and estradiol and the incidence of mammary tumors as well as with the time required for their appearance. Estradiol appears to be the more potent of the two.

The recovered pellets were weighed and the effective dose of estrogen required for tumor induction calculated. Two micrograms of each sufficed to produce mammary adenocarcinoma in 5 per cent of the mice. The absorption necessary to produce tumors in 50 per cent of mice (TD₅₀) is computed at 4 to 10 micrograms for estradiol, and between 20 to 40 micrograms for diethylstilbestrol.

There is no predilection for the occurrence of the tumor near the site of estrogen implantation. There appears to be a correlation between the appearance of multiple mammary adenocarcinoma with the larger doses of estrogen.

The urinary excretion of estrogens in female mice is 0.05 to 0.1 micrograms per day. Thus, the TD₅₀ dose of estradiol and diethylstilbestrol for male mice is roughly equivalent to the normal urinary excretion in female mice during 100 to 500 days, respectively. I.e., the carcinogenic dose for male mice is well within the range of concentrations physiologically elaborated by normal females of the species.

The absence of hepatomas in the estradiol and diethylstilbestrol treated mice up to the age of 10 months is of interest. Normally male C3H mice from 11 to 19 months of age show a 25.8 per cent incidence of hepatomas and female mice of this strain in this age group show an incidence of 5.7 per cent. After 19 months some hepatomas did appear—an incidence of approximately 11 per cent in the diethylstilbestrol treated mice of 21 per cent in the estradiol treated mice, and 18 per cent in the triphenylethylene treated mice. It is suggested that "the later appearance and lower incidence of hepatomas in this experiment may be an effect of estrogenation."

FRANK B. QUEEN, M.D.

Shabad, L. M.: Trends in Cancer Research in the USSR. *Am. Rev. Soviet Med.* 1946, 4 66

The author reviews, as the title indicates, the important developments in cancer research in the USSR. He states that in the USSR, extensive surgery is practiced on cancer. Petrov and his associates at the Leningrad Oncologic Institute have done extensive pioneer work on gastric resections, new surgical methods

for cancer of the esophagus, and on electrosurgery of the stomach. X-ray treatment of bronchogenic carcinoma has been improved by the method of Dillon because the therapy is given through numerous skin sectors converging on the cancer which requires exact topical diagnosis.

Tumor research has followed the same general lines as in the United States of America. The synthesis of various derivatives of 1,2 benzantracene and their carcinogenic activity have been studied. Amino-azo-compounds have been rather extensively studied and a transplantable hepatoma was developed in mice. Dispersion of chemical carcinogens has been studied by measurements of fluorescence. A colorimetric method for determination of amino-azo-carcinogens has also been developed. This is applicable to tissues and fluids.

One interesting experiment reported deals with the influence of inflammation on carcinogenesis. 3,4,8,9 dibenzopyrene painted with turpentine solvent lowered the incidence of carcinoma formation in mice according to the theory of an "antiblastic" function in acute inflammation. Experiments designed to test the relationship of chemical carcinogenic activity to toxicity disclosed no correlation.

Endogenous carcinogens have been studied and as in this country substances having carcinogenic activity were extracted from the liver, bile, lungs, and occasionally from the urine of patients dying with malignant neoplasms. The nature of these endogenous carcinogens is unknown but it is concluded that they are not cholic or desoxycholic acid.

A synergistic action between exogenous and endogenous carcinogens is postulated. Active carcinogenic factors have been studied without definite conclusions.

Considerable attention has been devoted to virus tumors. The author considers that the agent of "virus" growth may be an endogenous chemical substance of cellular origin. Experiments cited permit no conclusion either way.

A complement fixation test aiding in the recognition of the milk factor in spontaneous mammary carcinoma of mice (strain A) and in an inoculated growth (strain MAF) is also reported. The author questions whether the milk factor is a virus or an endogenous chemical produced by the epithelial cells of the mammary gland.

The role of heredity has been studied in some detail in 156 pairs of human twins, at least one of whom developed cancer. Of 31 pairs of monozygotic twins, 27 presented only one of the pair with cancer while both twins in 4 pairs suffered from cancer (22% similarity). In 95 pairs of dizygotic twins, both members were affected in 13 pairs (13.7%) an incidence close to that of monozygotic twins. This leaves no foundation for assuming a general hereditary susceptibility to neoplasia in man. However the neoplasia is similarly located much more frequently in monozygotic twins than in dizygotic twins. Thus, the reactivity of tissues to the carcinogenic agent may depend directly upon genetic factors.

The studies in carcinogenesis have shown that some polymorphocellular sarcomas are of myogenic origin

and that these malignancies tend to slow down growth and revert to the primary normal tissue. Nuclear studies show a typical mosaic consisting of translocations of various chromosomes in malignant cell nuclei.

The antitumoral cytotoxic serum of Bogomolets was tested for the control of metastases and relapses after surgical excision of cancer. Results are not mentioned although it is stated that the use of this serum in animals (mice) reduced the development and incidence of methylcholanthrene tumors.

The section of certain nerves is said to modify the growth of experimental tumors and the localization of metastases.

The anticancer properties of blood and spleen (antiblastic properties) studied in mice with early carcinoma were found to be absent in the serum of cancer patients but they were present in that of healthy men.

The mitogenetic property of blood and tissues was studied from a diagnostic viewpoint. This mitogenetic radiation of the blood was lost in cancer cases because of a special substance called "extinguisher." 'Extinguisher' also appears in the blood of mice following the subcutaneous implantation of carcinogens.

FRANK B. QUEEN, M.D.

GENERAL BACTERIAL, PROTOZOAN AND PARASITIC INFECTIONS

Curley F. J. and Aycock, W. L.: *The Effect of Stilbestrol on Resistance to Experimental Polymyositis*. *Endocrinology* 1946, 39, 414.

In previous experiments it had been shown that the resistance of castrated monkeys to intranasal instillation of the virus of polymyositis was enhanced by the intramuscular injection of estrogenic hormone. The present experiments were performed to determine the conditions under which this enhancement occurred. They did not in themselves afford any indication as to whether the mechanism of resistance set up by the administration of estrogen lay in a physiological blockade of the nasal mucosa (in the fashion of a chemical blockade produced by local application) or in some more deep-seated structure, as, for example, the central nervous system itself.

In the first group of experiments normal immature monkeys were treated with stilbestrol, testosterone propionate or both, and were then subjected to intranasal instillations of monkey polymyositis spinal cord emulsion. In the second group the experiments were repeated, but in these animals castration had been performed a weeks before the beginning of hormone injections. The stilbestrol-treated animals which failed to succumb were later inoculated intracerebrally along with normal monkeys as controls. In the third group castrated female monkeys were treated with reduced amounts of stilbestrol and then inoculated intranasally along with the controls. The monkeys which survived were inoculated intracerebrally.

The treatment of normal monkeys with stilbestrol or testosterone produced no increase in resistance, while stilbestrol treated castrates showed a marked

increase in resistance to intranasal instillations of the virus. Testosterone alone had no protective effect. Stilbestrol treated animals which had resisted repeated intranasal instillations of virus, although kept on stilbestrol, showed no increased resistance to subsequent intracerebral inoculation.

That repeated intranasal instillations of virus under the protection of stilbestrol did not serve to immunize is indicated by the fact that subsequent intracerebral inoculation resulted in experimental poliomyelitis in all animals so treated. That the intracerebral inoculations were not too severe a challenge as a test for immunity is suggested by previous studies demonstrating the resistance of intracerebrally immunized monkeys to similar intracerebral inoculations.

DAVID H. LYNN, M.D.

Cherkasov A. V.: Peculiarities of the Disease Course in Recurrent Typhus in Children. *Pediatrics, Akusherstvo i Ginekologiya*, 1946 No. 2, p. 8.

Cherkasov noted numerous cases (26 per cent) in which there were more than 3 recrudescences and remissions in the course of the illness. Four and one-half per cent of the patients had recurrence of fever following apyretic periods. Not infrequently there were disturbances in the usual course of the disease. In 11 per cent the second attack was longer than the first. In 7 per cent the third attack was longer than the second. In 6 per cent the second period of apyrexia was of shorter duration than the first, and in 4 per cent the two periods of apyrexia were of equal duration. Frequently the recurrence took place after as long a period of apyrexia as 15 days. In general, the course of the disease was favorable, that is, there were no deaths in uncomplicated cases. A 3 dose course of mapharsen increased the number of patients who suffered a single relapse of typhus. As a rule, penicillin produced a fall in temperature in the course of the first 24 hours; however a 4 day course of this drug did not prevent recurrence. Nevertheless the recurrent attack occurred later (after 14 or 15 days) as a rule and exhibited a milder course (1 or 2 days). The antireticular cytotoxic serum of Bogomilits did not produce remission of the attack when given alone, and, in the author's opinion, did not modify the duration of the individual attack nor prevent recurrence.

JOHN W. BRENNAN, M.D.

Tsilba, M. D., and Trushinskaya, M. M.: Peculiarities of the Disease Course in Abdominal Typhus in Children at Kiev from 1944 to 1945. *Pediatrics, Akusherstvo i Ginekologiya*, 1946, No. 2, p. 12.

Tsilba and Trushinskaya note that in the material of the Osmatdeta Institute for Infectious Diseases for the years 1944 and 1945 the cases of abdominal typhus in children ran a rather severe course in the majority of instances. In 74.6 per cent of the patients the course of the disease was severe or moderately severe. Especial attention is directed to the long period of complete morbidity and to the relapses and manifestations of the cardiovascular system. In the

neuropsychiatric sphere also there were pronounced manifestations. In many instances the early exhaustion of the nervous system was notable and there were pronounced manifestations of asthenia and psychic disturbances in the sense of a negativism. Encephalitic manifestations were both frequent and early.

The Widal reaction was positive in 54 per cent of the children with an outspoken clinical picture of typhus abdominalis appearing however more frequently in the later course of the condition, or even during convalescence. In two or three periods during the height of the clinical picture of typhus abdominalis, the characteristic macroscopic changes in the small intestines were found. However, in the great majority of children, microscopic examination failed to uncover the characteristic local hyperplasia of the reticular cells of the lymphoid tissues in Peyer's patches and in the regional lymph glands. Every picture of the changes in the lymphatic tissues in these young patients was characterized by the complete absence of germinal centers in the follicles of the lymph glands and by the poorly developed hyperplasia of the reticular stroma. In the authors' opinion this indicates a lowering of the reactive power of the organism of the child.

JOHN W. BRENNAN, M.D.

DUCTLESS GLANDS

Dougherty T. F., and Whitte, A.: Pituitary Adrenal Cortical Control of Lymphocyte Structure and Function as Revealed by Experimental X Radiation. *Endocrinology*, 1946, 39, 370.

A single injection of either pituitary adrenotropic hormone or adrenal cortical preparations have produced changes in lymphoid tissue similar to those seen following roentgen radiation. This suggested to the authors that pituitary-adrenal cortical secretion might be a normal physiological mechanism concerned with certain of the physiological actions of x rays. Recent studies, however, have demonstrated that whereas small doses of x-rays produced unmistakable alterations in lymphoid tissue structure and function of normal mice, large degrees of radiation would produce similar effects even in the absence of the animal's adrenals. These observations suggested further study with radiation.

Mice of both sexes, some of which were adrenalectomized, and male rats, some of which were either hypophysectomized or adrenalectomized, were used. Radiation was generalized over the entire body. Determinations were then made of the total white count, differential count, whole blood specific gravity, total serum protein, and their components as separated by electrophoresis and the anamnestic response to x rays of those animals immunized to sheep erythrocytes. A careful histological examination was also performed at autopsy particularly on all lymphoid structures.

X-irradiation of normal animals produces an increased secretion of pituitary adrenotropic hormone

as evidenced by a depletion of sudanophilic material of the adrenal cortex and a marked decrease in the total cholesterol content of the adrenals.

Irradiation of normal mice with 10 or 200 roentgens, and normal rats with 200 roentgens, produces a decrease in the absolute number of circulating lymphocytes. On the other hand, the adrenalectomized mice, given 10 roentgens, do not show a significant lymphopenia. Two hundred roentgens produce a profound leucocytosis with absolute lymphopenia in adrenalectomized mice or rats and in hypophysectomized rats. This effect could not be ascribed to hemodilution since the specific gravity of the blood was increased slightly. Handling of the mice prior to irradiation was found not to lower the lymphocyte count, as had been suggested by certain other investigators.

Irradiation of normal mice with 10 or 200 roentgens, or adrenalectomized mice with 200 roentgens revealed histologically a degeneration of lymphocytes with an initial development of macrophages, edema of the lymph nodes, and swelling of the reticuloendothelial cells. The disappearance of the lymphocytes resulted in a decreased size of these organs. These changes were similar to those observed in a previous study following the injection of adrenotropic or adrenal cortical hormones. Adrenalectomized mice exposed to 10 roentgens showed only very slight changes in lymphocyte structure and a shorter period of time for the maximal effect of lymphocyte dissolution. The most significant histological difference between the normal and adrenalectomized mice given 200 roentgens was the extreme rapid reconstitution of lymphoid tissue which occurred in the operated animals.

Irradiation produced in all instances a large increase in gamma globulin and a slight increase in the beta fraction. Alpha globulin of adrenalectomized mice, but not of normal mice, also increased following 200 roentgen exposure. The authors reason that the release of globulin to the circulation results from the normal dissolution of lymphocytes in lymphoid structures and is under pituitary-adrenal control unless large doses of radiation are used.

The anamnestic response was not marked in adrenalectomized mice given 10 roentgens in contrast to the response in the unoperated animals, or to large doses. This suggests that 10 roentgens influenced lymphoid tissue function by augmenting pituitary-adrenal cortical secretion.

Previous investigation has shown that one of the regulators of the rate of delivery of lymphocytes to the circulation is pituitary-adrenal cortical secretion. Lymphopenia following the administration of adrenal cortical steroids is a reflection of lymphocyte dissolution in lymphoid organs. Conversely the lymphocytosis of adrenalectomized animals is probably due to the absence of the hormonal mechanism normally controlling lymphocyte dissolution.

The authors suggest that x rays have both a direct and an indirect effect on the lymphocytes, the latter effect being mediated by the increased pituitary-adrenal cortical activity.

DAVID H. LYNN, M.D.

Housay, B. A., Foglia, V. G., and Martínez, C.: The Influence of the Thyroid on Alloxan and Pancreatic Diabetes in the Rat. *Endocrinology* 1946 39 351

This study concerns itself with the effect of the thyroid deficiency and thyroid excess on the diabetes produced in the rat by the administration of alloxan, or by the extirpation of 95 per cent of the pancreas. Hypothyroidism was produced by thyroidectomy or by treatment with thiouracil whereas hyperthyroidism was obtained by the administration of powdered thyroid. Alloxan was given either intravenously or intraperitoneally.

Thyroidectomized animals showed a greater resistance to the diabetogenic and toxic actions of alloxan than did normal animals. Resistance to alloxan was below normal 20 days after daily thyroid treatment, and above normal 60 days after daily treatment. Thiouracil treatment produced an even greater resistance to alloxan than did thyroidectomy. Thyroidectomy when performed simultaneously with pancreatectomy prevented the appearance of diabetes but had no effect on incipient or manifest diabetes. Thiouracil treatment prevented the appearance of diabetes after pancreatectomy in a large percentage of animals. Thyroid treatment in pancreatectomized rats caused an earlier appearance of diabetes during the first 15 days later, however this diabetic state gradually disappeared, not to reappear in spite of continuous treatment. Diabetes appeared in all contrasted rats and persisted. Incipient diabetes in pancreatectomized rats completely disappeared with thyroid treatment.

The authors postulate that thiouracil may increase the resistance to alloxan by virtue of the presence of sulfur or the sulphydryl group ($-SH$) in the thiouracil molecule. These experiments indicate that hypothyroidism exerts a certain degree of protection on the B cells which the authors suggest may be the result of (1) a relative functional rest of the islets since the lowered metabolism and rate of growth requires less insulin (2) a modification of the anatomical or chemical constituents of the islets, making them more resistant to diabetogenic factors and (3) increase in the production of insulin brought about by hypothyroidism.

Histological study seems to indicate that thyroid administration in rats, in continuous form would lead to an improvement or to the disappearance of diabetes due to a new formation of islets or to the enlargement of the existing ones in the portion of the pancreas which remains after operation. This is in contrast to the results obtained in the dog.

DAVID H. LYNN, M.D.

SURGICAL PATHOLOGY AND DIAGNOSIS

Bing, J., Neeser, J. Rasch, G., and Røsjel, K.: Serum Proteins in Normal People. *Acta med scand.*, 1946, 126 351

Although numerous investigations have been made concerning serum proteins and their fractional values

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in disease states the authors observed that there was a paucity of material regarding the protein content of normal serum. In reviewing the literature they noted a constant difference according to the method of protein analysis used. Of the two chief determinations, that of Henriques and Klausen is considered more exact when compared to the test of Howe.

The total serum protein albumin, and globulin were measured in 87 clinically normal people (38 males and 49 females) by the method of Henriques and Klausen. A careful statistical analysis of the results was made with attention to the variation according to sex and age. Although small differences were found for these factors they were so small that for practical purposes they can be ignored. The following values were obtained:

Total protein	5.6-8.2
Albumin	3.5-5.5
Globulin	1.6-3.2

C. FREDERICK KITTLE, M.D.

EXPERIMENTAL SURGERY

Blaine, G.: Experimental Observations on Absorbable Alginate Products in Surgery. *Ann. Surg.* 1947 125 102.

The author briefly describes important advances made in the prevention of adhesion formation in the course of tissue repair: the arrest of capillary hemorrhage and the closed treatment of burns through the development of new materials. He states that there are disadvantages to some of the materials previously used. He also states the qualifications of any new material to be used—absorbability at a readily controlled rate, the tissue reaction must compare

favorably with that of protein fibers and oxycellulose, the material must be easier and cheaper to produce, it must be compatible with penicillin and other antibacterial substances. It must allow sterilization by routine methods, its physical properties must allow modification of plasticity and it should be able to "carry" substances and ensure their controlled, delayed absorption in the organism. Such a material, he believes is found in the extract of brown seaweeds—alginate acid—the formula of which resembles that of cellulose. Many salts can be prepared from this acid. The sodium salt—sodium alginate (NaAlg)—undergoes instantaneous coagulation when acted upon by calcium. This reaction is the basis of preparing clot, film, filament (from which gauze can be woven) or foam. A certain limited range of rigid plastic objects can also be prepared.

The author describes the physical properties of the most useful salt—calcium alginate (alginate gel, film, gauze and foam)—its ready sterilization, its biochemical properties, and its physiological properties in animal tissues.

From the experiments on alginate products he concludes that this substance, used as clot, film or gauze is absorbed in animal tissues. Tissue reaction is minimal and the rate of absorption can be varied by the use of various strengths of sodium alginate or calcium chloride. The absorption rate varies with the physical form and bulk of the product—alginate cloth or gauze is slowest, the alginate film is quickest. Alginate products are readily autoclaved and have no inhibitory effects on penicillin. In view of these findings, the author believes "alginate products possess properties making them attractive for surgical use."

G. ALAIN LEVA, M.D.

SURGERY

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PULMONARY RESECTION FOR SOLITARY METASTATIC SARCOMAS AND CARCINOMAS

JOHN ALEXANDER M.D., F.A.C.S. and CAMERON HAIGHT M.D. F.A.C.S. Ann Arbor Michigan

THE appearance of a presumed solitary metastatic lesion in a lung months or years after the apparent complete removal of a primary extra pulmonary sarcoma or carcinoma is far from rare. If untreated surgically these patients almost invariably¹ die, usually from the invasive infectious or pressure effects of enlargement of the original metastatic lesion and from other metastases. A search of the literature reveals only 5² case histories (4 additional cases were merely mentioned by Churchill) in which both the primary and the metastatic pulmonary lesions have been removed. The first record is that of Barney and Churchill their patient being alive and well 12 years after removal of the metastatic lesion. The present report includes 19 additional case histories from various clinics which have not been published previously. Of the 24 patients 11 have had recurrence of their neoplasms 1 died as a direct result of operation and 12 are apparently free from recurrence. Among the latter however are 4 whose pulmonary resection operations were performed less than a year ago in 8 the operations were performed more than a year ago namely 12 7 6 5 4 3 1 1/4 and 1 years ago respectively.

An operation performed to remove a metastatic malignant neoplasm that is assumed to

be a solitary one (because no other can be found at the time) is obviously a gamble. As there is some chance of success and as failure to remove the lesion surgically will result in the death of the patient the operation needs no other justification.

The appearance of an x ray shadow of a tumor in a lung at the time of or months or even years after the removal of a malignant lesion from some other part of the body is *prima facie* evidence that the pulmonary tumor is a metastatic one. The chance of this being so is especially great if the tumor has sharply defined margins and if it is round. Nevertheless the pulmonary tumor may be primary and either malignant or benign. In many of the collected cases and in the University of Michigan Hospital patients H.A.B. and V.A.B. the surgeons could not determine before operation whether the pulmonary lesion was primary or metastatic and in several instances mistakenly believed them to be primary.

The presence of a bronchoscopically visible neoplasm is not proof that the lesion is primary in the lung since enlarging metastatic neoplasms not infrequently penetrate a bronchial wall or the metastasis may have first lodged in a bronchial wall. The histopathology of a bronchoscopic biopsy specimen usually indicates whether the lesion is metastatic to the lung or primary there. The presence or absence of pulmonary symptoms is of little or

From the Department of Surgery, University of Michigan.
¹Spontaneous disappearance of metastases has been reported.
²See footnote, No. 1.

no value in the differentiation between primary and metastatic pulmonary lesions since both may be symptomless when small or not involving a large bronchus, and both may produce symptoms when large or involving a large bronchus.

The most important criteria for the surgical removal of a presumed solitary pulmonary metastatic lesion are

- 1 A thorough physical and x ray examination shall have discovered no other metastasis. Such an examination should include careful palpation for enlargement of lymph nodes and liver and for tumors in the skin, bones, and all palpable organs. The chest x ray examination should include stereoscopic posteroanterior projection films and lateral or oblique projections as well as fluoroscopy in all standard projections. X ray films of the skull and all the long bones may be worth making.

- 2 Reasonable assurance should be had that the primary neoplasm has been completely removed. This is given if the primary neoplasm was removed 3 or more years before the contemplated pulmonary operation without the signs or symptoms of recurrence. In doubtful cases (e.g. see below Case Reports, University of Michigan Hospital, patients L.H.W. and A.B.) an exploratory operation and removal of a biopsy specimen may be advisable.

- 3 The patient must be in sufficiently good general condition for the contemplated pulmonary operation and with regard to pulmonary function able to spare a lung a lobe or a part of a lobe the extent of the resection depending upon the extent and location of the neoplasm.

The length of time that has passed between the complete removal of the primary neoplasm and the appearance of the presumed solitary metastatic lesion in a lung is important with regard to the validity of an assumption that the single demonstrable metastasis is actually the only one. If only one metastatic lesion (especially if it is a large one) can be found several years after the primary lesion has been removed there is probably a better chance that no other metastases exist than if the metastatic lesion were found shortly before or after removal of the primary lesion because in the latter instance relatively little

time has passed for the development of other metastases. This argument however is not wholly sound and not always applicable since the late appearance of a single small metastasis strongly suggests that it has been dormant or of a low grade of malignancy and therefore, that if other metastases are present they too may be small and not yet clinically demonstrable because of the absence of symptoms and physical and x ray signs. The lung owing to its radiotranslucency is a particularly favorable organ for the very early detection of a metastasis, perhaps before metastases in other organs can be found. It should be noted however that the discovery of a single pulmonary metastasis soon after or even before, the removal of the primary neoplasm does not necessarily indicate that other metastases will appear later. With due allowance for the exceptions mentioned, however the late appearance of a single metastasis offers a better chance that other metastases are not present than if the single metastasis appeared early.

When one or more metastases appear subsequent to the removal of a presumed solitary pulmonary metastasis, they may have arisen from the primary neoplasm before it was removed from some other metastasis that has not been detected or if the primary neoplasm had not been completely removed they may have come from it after the pulmonary resection operation. When one or more metastases appear within a few weeks or months after the removal of the original pulmonary metastasis, especially in cases in which one or more years have intervened between the removal of the primary neoplasm and the first symptoms or signs of the first metastatic lesion it is likely that these are second generation metastases and had their source in the original metastatic lesion. Pathologists not rarely find that the neoplastic cells of the pulmonary tumor which has been removed had penetrated its capsule or had traversed a blood vessel wall such unfavorable events are probably most likely to occur in tumors that have grown to a large size or that are composed of cells of relatively great malignancy.

As trauma of the tumor at the time of operation might be the determining factor in the dissemination of neoplastic emboli unusual

gentleness should be used in the handling of the lung and preferably the pulmonary veins should be ligated as early in the operation as possible. Since the chance of dissemination of the neoplasm from the original metastasis probably increases with growth of the tumor it should be removed as soon as possible and the temptation avoided of postponing a decision about operation while waiting to learn if later examinations of the patient might reveal other metastases.

The number of known cases in which a primary neoplasm and its pulmonary metastatic lesion have been removed is too small to determine the truth regarding the theoretical considerations discussed in the last three paragraphs or to justify the drawing of other conclusions from Table I. The 2 patients in whom the longest period elapsed between the removal of the primary neoplasm and the first symptom or sign of a pulmonary metastasis, namely 10 and 13 years respectively, had recurrences following resection of the original pulmonary metastasis.

Among the 24 cases there were 16 carcinomas and 8 sarcomas. Six of the 8 sarcomas but only 6 of the 15 carcinomas (excluding a carcinoma patient who died as a result of operation) are apparently free of recurrence. One of the sarcomas and 2 of the carcinomas, however, were operated upon less than 4 months ago and another sarcoma patient only 9 months ago. Four out of 6 renal cell carcinoma patients (including 1 operated upon a month ago) are free of recurrence. Only 2 other carcinoma patients are free of recurrence, 1 for 3 years and the other for 3½ months after pulmonary resection.

Only 1 of the 24 patients died as a direct result of operation. Safe operation however is of only incidental importance with regard to the subject of this article: freedom from recurrence 1 year, 3 years and especially 5 years after the pulmonary resection operation is, of course of major importance. 4 patients (see Table I) in whom no recurrence appeared within 1 year after the pulmonary operations are included in this article only because all known patients in whom both the primary and metastatic lesions have been removed are included. No patient is included whose pulmo-

nary lesion was removed first in the mistaken belief that it was a primary neoplasm, if the true primary neoplasm was not later removed. Occasionally two metastatic lesions have been removed by a single lobectomy or pneumonectomy operation: there are only two records known to us in which a second metastatic pulmonary lesion was removed by a subsequent pulmonary resection operation (University of Michigan Hospital patient L. H. W. and a patient mentioned by Churchill for whom bilateral partial lobectomy operations were performed). In all 24 cases the histopathologic examination of the pulmonary lesions indicated that these lesions were metastatic rather than primary in the lung.

The following reports include all cases of pulmonary resection for metastatic neoplasms (before or after removal of the primary neoplasm) we have been able to collect from publications (5 cases)² by casual inquiry among surgeons but not by systematic questionnaires (13 cases) and from the University of Michigan Hospital (6 cases), with the exception of 4 cases briefly mentioned in a table presented by Churchill in a 1940 article: 1 of Churchill's patients had a bilateral partial lobectomy, 2 had total lobectomy and 1 had total pneumonectomy. The only other information given about these patients is that there were no hospital deaths. A fifth patient listed in Table I is the one appearing below under Barney and Churchill. Almost certainly there are a considerable number of unpublished cases of which we have not heard: Dr Alfred Blalock, Dr Duane Carr, Dr O. T. Clagett, Dr F. S. Dolley, Dr Stuart W. Harrington, Dr Paul C. Samson and Dr Richard H. Sweet have generously sent us the unpublished histories of their patients with permission to use them in this article.

CASE REPORTS⁴

Well 12 years after partial lobectomy which was 15 months after nephrectomy for carcinoma

Since this article was prepared we have seen an article by Manderville (see References) in which 4 cases are reported in which both the primary and solitary metastatic pulmonary lesions were removed. One patient died during pneumonectomy and died from secondary metastases within a year after pneumonectomy. The prognosis in the fourth patient is grave because a large group of cancerous lymph nodes was found in the pulmonary hilum at the time of the recent pneumonectomy.

⁴The cases are arranged in chronological order with regard to the dates of their pulmonary resection operations.

TABLE I.—SIGNIFICANT DATA ABOUT THE 24 KNOWN PATIENTS WHO HAVE HAD PULMONARY RESECTION FOR METASTATIC NEOPLASMS

Patients of	Kind of neoplasm and site of the primary lesion	First symptom or sign of metastasis after removal of primary	Pulmonary resection after removal of primary	No sign or symptom of recurrence since pulmonary resection	First symptom or sign of recurrence after pulmonary resection	Death after pulmonary resection
		Years Months	Years Months	Years Months	Years Months	Years Months
Burns and Churchill	Renal cell carcinoma	Metastases the covered first	3			
Fitch & Dailey	Carcinoma of mandible	9				
Case of Mch. Hosp., L.H.W.	Neurogenic sarcoma of ulnar nerve	3 1/2				1 1/2
Richard H. Sweet, No.	Sarcoma of breast		3 1/2	6	7	
Farrington Ekins	Carcinoma of sigmoid					
Timney and McDonald (and W. Harrington)	Renal cell carcinoma			4		
Case of Mch. Hosp., A.B.	Myogenic sarcoma of thigh		9	4		
Richard H. Sweet, No.	Carcinoma of ovary					
Brems and Lindskog	Carcinoma of uterus		2 1/2			+
Wood Kieck	Carcinoma of rectum		6		3+	3 1/2
Deane Carr	Osteogenic sarcoma of thigh	7	30			
Drum and Lindskog	Carcinoma of bladder and ureters	8 to 9	8 1/2 to 9		3+	30
E. W. Harrington	Carcinoma sarcoma of testis				6	8
Richard H. Sweet, No. 3	Fibrosarcoma of thoracic wall					
Richard H. Sweet, No. 4	Renal cell carcinoma	3 1/2	3 1/2			
Richard H. Sweet, No. 5	Renal cell carcinoma					
Case of Mch. Hosp., R.L.L.	Fibrosarcoma of thigh		8		3 1/2	Date of death unknown
O.T. Chaffin, No.	Carcinoma of rectum					
Richard H. Sweet, No. 6	Renal cell carcinoma				8	
Case of Mch. Hosp. H.A.B.	Carcinoma of rectum		6		9	
O.T. Chaffin, No.	Chondrosarcoma of os calcis		3	3 1/2	3	8
Case of Mch. Hosp. I.L.M.	Spindle cell sarcoma of leg	4				
Paul C. Sisson	Carcinoma of colon	6	6	3 1/2		3 1/2
Case of Mch. Hosp., A.A.B.	Renal cell carcinoma	8	8 1/2			

The patients are listed chronologically according to the dates of pulmonary resection.

Only the 3 cases of Burns and Churchill; Brems and Lindskog; Ekins; and Timney and McDonald have been published before.

The patient's first lobectomy was followed by the appearance of second metastases for which another lobectomy was performed. The two lines of metastases were in the same area.

Multiple operations were performed for recurring carcinomas of the bladder and ureters during a period of 8 years and months. As the particular point from which the pulmonary metastases arose is not known, the metastases might have occurred at any time during this period.

doubled in size. On July 18, 1933, Dr. Churchill resected two-fifths (the lingular portion) of the left upper lobe including the tumor which measured 6 by 4 by 5 centimeters. There were no pleural adhesions although in one place the tumor extended to the visceral pleura. No pleural or lymphatic metastasis was seen. Microscopically the tumor consisted of renal adenocarcinoma cells that were much larger and more atypical than those in the renal tumor.

The patient was last seen 12 years after the removal of the pulmonary metastasis when she was 67 years of age. She was in perfect health and there was no demonstrable clinical or x-ray evidence of any other metastasis.

This is the earliest case of which we can find a record in which a metastatic lesion in the lung was successfully removed either before or after the removal of the primary malignant lesion.

Death 3 days after removal of left lower lobe and partial removal of left upper lobe which was 9 years and 4 months after resection of the jaw for carcinoma.

Dr. Frank S. Dolley's patient, 54 years of age, had an extensive resection of the mandible for carcinoma in 1928. A nonproductive cough developed in January 1937. Later chest x-ray films showed a circular shadow extending from the left border of the heart and an indefinite density at the left first costal level. On April 30, 1937, Dr. Dolley removed the lower lobe which contained a subpleural tumor 4.5 centimeters in diameter and also removed a wedge-shaped portion of the upper lobe which contained two subpleural nodules, the larger being 2 centimeters in diameter. The microscopic diagnosis was metastatic adamantinoma, probably derived from epidermal

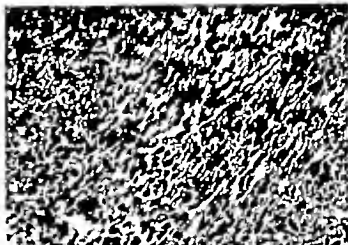


Fig. 1. Patient L. H. W. Section from the Cleveland Clinic. Spindle cell sarcoma of neurofibromatous origin (ulnar nerve). Highly cellular tendency to form whorls, occasional division figures. Infiltration of voluntary muscle. A large nerve trunk is present within the neoplasm.

epithelial structures. The patient developed an extensive bronchial pneumonia and died 3 days after operation. Permission for a postmortem examination could not be obtained.

Well 6 years after the second of bilateral lobectomies which were performed 13 and 26 months, respectively after removal of a neurogenic sarcoma of the forearm.

L. H. W., No. 446282, a 22-year-old woman, a schoolteacher, was first admitted to the University of Michigan Hospital on July 7, 1939. In September 1937, a marble-sized nodule was noticed on the ulnar aspect of the left forearm a short distance below the elbow 2 weeks following a fall on this arm. The nodule was massaged for 9 weeks by a physiotherapist, during which time it increased in size, became tender, and

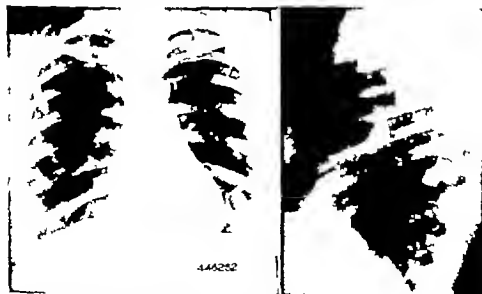


Fig. 2. Patient L. H. W. Roentgenograms of July 7, 1939. Round shadow in right lower lobe 1 year after sarcoma was removed from forearm. In a, left, the lesion is seen at the anterior end of the fourth rib and in b, overlying the spine (arrows).



Fig. 3 Patient L. H. W. Metastatic lesion in right lower lobe of lung of same type and degree of cellularity as lesion shown in Figure 1. Atelectatic lung surrounds the neoplasm.

numbness developed in the fourth and fifth fingers. In January 1938 an orange-sized tumor was excised but in March 1938 a still larger tumor appeared causing pain in the arm and hand. Sarcoma was diagnosed from a slide and x-ray therapy was given but without favorable effect.

In May 1938, the patient went to The Johns Hopkins Hospital where Dr. Dean Lewis advised amputation and Dr. Walter Dandy advised wide excision. The next month she consulted Dr. Alexander T. Bunts of the Cleveland Clinic. She was then having intractable pain in the arm and hand. Chest x-ray films showed no lesion. On June 7 1938 Dr. Bunts widely excised the tumor including the ulnar and median nerves and muscle masses. Microscopically

the tumor was a spindle cell neurogenic sarcoma (Fig. 1).

A year later the patient returned to Dr. Bunt because of pain in the hand and forearm. She had gained 16 pounds in weight during the preceding year. Although there was no palpable evidence of local recurrence Dr. Bunt reopened the incision on June 23 1939, finding only a benign neuroma in the stump of the ulnar nerve. He injected the proximal end of both the ulnar and median nerves with alcohol. Check up chest x-ray films at this time showed a 2 centimeter circular nodule in the right lower lobe. Dr. Bunt referred the patient to us for consideration of lobectomy.

We first saw the patient on July 7 1939. She had no cough, hemoptysis, dyspnea or pleural pain although she spoke of a mild aching in the right chest since learning of a lesion there a few days before. New x-ray films (Fig. 2) showed no change in the pulmonary lesion which on the basis of probability was considered to be a metastasis that had arisen from the forearm a year or longer previously rather than tuberculosis, a benign neoplasm, or a primary bronchogenic carcinoma.

The patient was obese weighing 145 pounds. Except for the defect in the upper left forearm and the atrophy of the muscles supplied by the ulnar and median nerves, a general physical and laboratory examination revealed no abnormality having any bearing on the present illness.

As only a single metastasis could be found 13 months after the primary neoplasm had been completely removed (as demonstrated by the exploratory operation on the forearm a year later) we agreed with Dr. Bunt that refusal to remove the metastatic lesion would be unjustifiable. On July 8 1939, therefore John Alexander removed the lower lobe of the



Fig. 4. Patient L. H. W. Roentgenograms of February 4 1940, 20 months after removal of sarcoma from forearm and 8 months after removal of right lower pulmonary lobe. Sharply margined shadow (arrow) appears to left of and behind, uppermost sternum. Roentgenogram to left shows elevated right diaphragm and rib defects resulting from lobectomy and empyema.



Fig. 5 Patient L. H. W. X ray film of June 17 1940. Great increase in size of left-sided lesion in 4 months (compare with Fig. 4)



Fig. 6 Patient L. H. W. Right anterior oblique roentgenogram of July 25 1940. Diagnostic pneumothorax shows that the left-sided tumor is in the lung not in the mediastinum

right lung. There were no pleural adhesions or fluid. The nodule was palpable deep in the lower lobe at the junction between its upper and middle thirds; there were no palpably enlarged hilar or mediastinal lymph nodes. Dr. R. C. Wanstrom of the Department of Pathology reported that the nodule measuring 3.5 by 2 by 2 centimeters was firm and well encapsulated. It was a spindle-cell neurogenic sarcoma (Fig. 3) of the same type and degree of cellularity as that removed from the forearm.

This 1939 lobectomy, which was among the last in this clinic performed by the tourniquet technique, was complicated by a shallow basal empyema with an intermittently open bronchopleural fistula. This condition was unusually troublesome because of pocketing in the broad shallow empyema space and was accompanied from time to time by fever and attacks of coughing and expectoration from the bronchial fistula. Several minor operations in the back and axilla were carried out before the empyema became obliterated and sputum ceased in May 1942.

Check up chest x ray films on February 14 1943 (Fig. 4) showed a homogeneous opacity with a well defined lateral border projecting from the left lateral border of the sternum above the aortic arch. In the lateral projection the mass lay immediately posterior to the plane of the sternum. This lesion had not been visible in the December 1939 roentgenograms. The patient was advised to have x ray therapy at home in Pittsburgh which she did not have. She returned on June 17 1940 when the lesion had increased more than twice in size (Fig. 5) since February. No other neoplastic lesion was visible.

The patient had gained 25 pounds during the preceding 6 months. A thorough physical examination revealed no other metastasis than that in the left lung and there was no sign of recurrence of the primary lesion in the forearm. As the absence of pleural

adhesions and the use of a tourniquet had permitted removal of the right lower lobe with almost no manipulation of the sarcoma deep within the lobe, the chance of this small lesion's having been the source of the metastasis to the left upper lobe seemed small. More likely was the chance that the metastases to both lungs had their source in the primary sarcoma before it had been completely removed 2 years previously. If this hypothesis were true only two metastatic lesions had become demonstrable in 2 years and there was at least a possibility that no others would appear. Small though this chance was, removal of the left upper lobe was recommended provided that a preliminary pneumothorax showed that the lesion was in the lung (which was found to be the

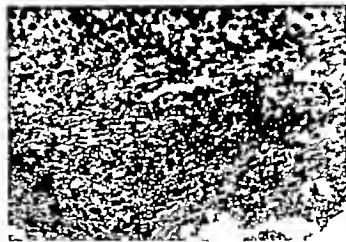


Fig. 7 Patient L. H. W. Metastatic spindle-cell sarcoma of left upper pulmonary lobe. More cellular and less well differentiated than the primary neoplasm or right pulmonary metastasis (compare with Figs. 2 and 3). Numerous cell division figures and hyperchromatic nuclei. In some areas the cells are losing their spindle form and are becoming large and round or oval. Extensive hemorrhage and necrosis.



Fig. 8. Patient L. H. W. on July 30, 1945

case (Fig. 6)) and not in the mediastinum. As the patient had been told elsewhere the nature of her trouble the situation with regard to operation was explained to her. She promptly chose operation small though she knew the chance of cure to be

The patient was readmitted to the hospital on July 24, 1940. The pneumothorax referred to in the last paragraph was induced and on July 26, 1940, John Alexander removed the left upper lobe which except for its lingular and inferior axillary segments, was almost entirely replaced by necrotic neoplasm. The only pleural adhesions were attached to the mediastinum above the pulmonary hilum and to the mesal first intercostal space and second costal cartilage. Many of these adhesions were found to be very vascular when divided. Division of the lower mediastinal adhesions, which apparently walled off an impending perforation of the cortex of the lung caused some of the semifluid necrotic contents of the neoplasm to spill into the pleural cavity which was thoroughly lavaged after the lobe had been removed. Those portions of the mediastinal and anterior parietal pleura that appeared as if they might contain sarcoma tissue were excised into grossly normal tissue and the mesal portion of the first internal intercostal muscle and what appeared to be the atrophic left lobe of the thymus gland were also removed. Microscopic examination of these tissues by Dr. R. C. Wamstrom showed no evidence of neoplasm. In the pleura were fibroblastic proliferation and organizing hemorrhage and in the thymus highly necrotic adipose tissue, occasional lymphocytic infiltration around vessels, and localized fibroblastic proliferation; in the intercostal muscle specimen were a group of cells suggesting a lymph node that had lost its follicular architecture. The pulmonary lobe and its necrotic hemorrhagic contents showed a spindle cell sarcoma that was more cellular and less well differentiated than the primary and right lower lobe neoplasms (Fig. 7).

During the 4 years following this operation the patient did very well except that the fear of recurrence caused an anxiety psychoneurosis that was manifested by such occasionally occurring subjective symptoms as aching in the throat, oppression at the suprasternal notch, blurring of vision and pain behind the eyes, a sensation of tightness in the throat and upper abdomen, an urge to gasp, undue dyspnea and a sensation of pressure around the forehead. Thorough physical examinations failed to reveal organic lesions as responsible for the symptoms. Knowledge of these findings and reassurance usually resulted in disappearance of the symptoms in a short time.

The last check up examination was made on October 17, 1946, which was 6 years after the second lobectomy, 7 years after the first lobectomy and 8 years after the removal of the primary sarcoma. There was no evidence of recurrence. The patient was in excellent health and during the preceding 2 years, she had worried little about recurrence and had been virtually free of the symptoms of anxiety psychoneurosis.

11 7 years after pneumonectomy which was 4 years after removal of breast sarcoma

Dr. Richard H. Sweet's patient No. 2, a woman, had a radical mastectomy performed by Dr. Daniel Fiske Jones and Dr. Sweet on January 1, 1935, for an immense sarcoma. The patient was well for 4 years and then developed a troublesome cough. X-ray examination showed a large round shadow in the right lower lung. No other evidence of primary or secondary neoplasm could be found. On November 3, 1939, Dr. Sweet removed the right lung. A tumor of the lower lobe had invaded by direct extension the adjacent surfaces of the middle and lower lobes. Microscopically the tumor was seen to have been metastatic from the breast sarcoma. The patient has been carefully followed to October 25, 1946 (7 years

after pneumonectomy) and has had no sign of recurrence or other metastases.

Recurrence 3 months after pneumonectomy which was 22 months after removal of a sigmoid carcinoma

Dr Forrester Raine's patient was a woman of 50 years of age who had had a carcinoma of the sigmoid removed in January 1939. In October 1939, coughing began and increased until she was admitted to the Milwaukee County Hospital on August 27 1940. She then had a severe hemoptysis fever night sweats and had lost 40 pounds in weight between October 1939, and September 1940.

X ray examination of the chest showed a shadow in the region of the right middle and lower lobes but no nodules elsewhere. There was no sign of recurrence of the sigmoid carcinoma. The liver was not enlarged and there was no palpable enlargement of lymph nodes. Bronchoscopy showed a large papillary mass in the right main bronchus just below the upper lobe bronchus; a biopsy specimen revealed adenocarcinoma typical of carcinoma of the colon.

A pneumonectomy was performed on October 14 1940. In addition to the principal tumor mass a separate nodule was found near the base of the lower lobe. Early in January 1941 the patient developed gastric distress and "presumably had metastasis near the liver."

Eleven years after pneumonectomy which was 3 years after nephrectomy for carcinoma

Dr W. S. Tinney's and Dr J. R. McDonald's patient a woman 39 years of age had a right nephrectomy for a renal cell carcinoma in July 1938 after 9 months of hematuria. A neoplastic thrombus was found in the renal vein. The patient was well until July 1940 when she had chest pain nocturnal dyspnea cough and hemoptysis. Bronchoscopy showed a tumor in the left upper lobe bronchus; a biopsy of which revealed a renal cell carcinoma.

The left lung containing a 5.5 by 4 by 3.5 centimeter tumor mass surrounding the major vessels and bronchi was removed by Dr Stuart W. Harrington on August 20, 1941 (sic). The tumor consisted of a metastatic grade 1 papillary renal cell carcinoma; the peribronchial lymph nodes contained carcinoma cells. The patient was last seen on June 8 1946 and was heard from on July 10 1946; she was in excellent general condition weighing 183 pounds and had no complaints except slight hemoptysis and an occasional cough. A bronchoscopic examination on June 5 1945 showed that the stump of the left main bronchus was in good condition; some inflammatory reaction and a small amount of blood were found in the right lower lobe bronchus; bronchiectasis was considered but not proved.

Eleven years after lobectomy which was 21 months after removal of a sarcoma of the thigh

AB No 473 121 a surgeon 50 years of age was first seen at the University of Michigan Hospital by Dr Frederick A. Collier on December 30 1940.



Fig. 9. Patient L. H. W. Last check up x ray film of October 17 1946. No evidence of recurrence 6 years after removal of second pulmonary metastasis, 7 years after removal of first pulmonary metastasis and 8 years after removal of primary neurogenic sarcoma of forearm.

Three weeks previously the patient had noticed an increase in the size of his lower right thigh. An initial peculiar sensation was succeeded by a dull ache. He had no recollection of trauma of the thigh. His father had died of carcinoma of the rectosigmoid at the age of 93 years and his maternal grandmother had died of carcinoma of the uterus. Otherwise the family's and the patient's own medical histories are not relevant to the present illness.

In general appearance the patient seemed to be well. His weight of 150 pounds was his usual weight. The blood pressure was 123/76 the hemoglobin 100 per cent the white blood cells 10,300 the urine normal and the blood Kahn reaction negative. On the lateral aspect of the right thigh extending from 10 to 20 centimeters cephalad to the patellar level there was a mass measuring approximately 10 by 5 centimeters, moderately fixed in the muscle firm and not fluctuant, and not reddened or tender. X ray films of the femur lumbar spine pelvis and chest and the general physical examination revealed no evidence of significant abnormality.

The thigh tumor which appeared to arise in the epimysium of the vastus lateralis and which was not attached to the femur was removed with an adequate margin of surrounding tissue by Dr Collier on December 31 1940. The Department of Pathology reported (this and all the subsequent pathology reports about this patient were made by Dr C. V. Weller or Dr R. C. Wanstrom) that the specimen weighed 168 grams and measured 10 by 6 by 6 centimeters. Microscopically the tumor was a spindle cell fibrosarcoma with many bizarre hyperchromatic nuclei; the voluntary muscle was infiltrated (Fig. 10).

On July 22 1941 a nodule in the skin scar which was believed to be an implantation metastasis, was



Fig. 6. Patient A. B. Spindle-cell fibrosarcoma from lower thigh. Many bizarre hyperchromatic nuclei, areas of necrosis, infiltration into skeletal muscle.

excised. It showed adipose and connective tissue infiltrated with spindle-cell sarcoma having many hyperchromatic nuclei.

Without Dr. Collier's approval the patient was given x-ray therapy of the former tumor area at another hospital between July 30 and August 15, 1941.

Chest x-ray films of June 24, 1941, and lumbar spine and pelvis roentgenograms of August 4, 1941, showed no significant abnormalities. The chest roentgenograms of August 4, 1941, however, showed

a small, smoothly rounded shadow at the lower border of the anterior first right rib which had not been visible in any previous x-ray film. Four other chest roentgenograms taken between August 4 and Sep-



Fig. 7. Patient A. B. Metastatic spindle-cell sarcoma of right upper pulmonary lobe exactly like that of thigh (Fig. 6). The lesion appears to be growing slowly.

tember 22 showed no change in the size or shape of the lesion, and no other lesion could be seen. Although tuberculosis and other conditions were considered as possibilities in the differential diagnosis, metastatic sarcoma seemed most probable and the case was, therefore, managed on this assumption.



Fig. 8. Patient A. B. Roentgenograms of September 22, 1945, 28 months after sarcoma was removed from thigh. Circular metastatic lesion is indicated by arrows.



Fig. 13. Patient A. B. Photographs of July 13, 1945. At left, the lobectomy incision is faintly visible. At right area of excision of sarcoma of thigh and subsequent x ray dermatitis has been skin grafted. Small ulcers on femur are not malignant.

We first saw the patient on September 3, 1942. He was understandably very apprehensive and had doubled his cigarette smoking from one to two packs a day which was followed by an increase in his cigarette cough and yellowish white sputum. Otherwise he had no symptoms and no thoracic pain. Physical examination revealed no important abnormality and there was no evidence of metastasis except the single supposed one in the right lung. The cervical, axillary, and inguinal lymph nodes were not enlarged. The thigh incision was healed except for two small necrotic areas in stitch scars. The region was firm, indurated and not tender; there was considerable roentgen dermatitis.

As nearly 21 months had passed since the removal of the primary sarcoma (13 months since the nodule in the skin incision had been removed) and as there was no evidence of any metastasis except the single one in the right lung, its removal seemed almost mandatory, provided that no recurrence had taken place in the thigh. On September 5, therefore, Dr. Collier removed 3 large slices from the indurated region of the thigh that had contained the primary sarcoma and that had become greatly fibrosed following x-ray therapy. Microscopic examination of 27 sections of this material revealed no evidence of recurrence.

On September 23, 1942, John Alexander removed the upper lobe of the right lung. The small nodule was immediately beneath the visceral pleura in the anterior part of the lung 3 centimeters inferior to the apex. There were no overlying pleural adhesions. A few tiny anastomatic lymph nodes were present



Fig. 14. Patient A. B. X-ray film of October 16, 1946, 4 years after lobectomy and 5 years and 8 months after removal of thigh sarcoma. No evidence of recurrence. The costophrenic angles are obliterated—the right as a result of the lobectomy and the left as a result of an old pleuritis.

among the hilar structures. A 9 by 3 centimeter portion of the upper lobe was congenitally fused with the apical portion of the lower lobe, requiring sharp division.

Gross examination of the lobe and microscopic examination of 7 large blocks of tissue showed only a single neoplastic nodule. This measured 3 by 8 by 12 millimeters. It was a spindle cell sarcoma (Fig. 12) exactly like that found in the thigh. Its center was necrotic and it appeared to have been growing only slowly.

The patient had an uneventful convalescence and was discharged from the hospital on October 6, 1942.

In January, 1943, a wide excision was made by Dr. Collier of the roentgen dermatitis area of skin and its contained ulcers and of the underlying fibrosed tissues. Microscopically no neoplasm was found. In February, 1943, Dr. Henry Ramson covered the denuded area with a split thickness graft 95 per cent of which lived.

The patient was last examined on October 16, 1946, 4 years after the lobectomy and 5 years and 8 months after the sarcoma of the thigh had been removed. He has no symptom or physical or roentgenographic (Fig. 14) sign of recurrence of the sarcoma. Flexion of the right knee is limited to 10 degrees because of a catching of the quadriceps tendon. He operates for approximately 5 hours on each of 5 days a week.

Recurrence (subsequent death) 1 year after lobectomy which was 10 years after removal of a carcinoma of the ovary.



Fig. 6. Patient A. B. Spindle-cell fibrosarcoma from lower thigh. Many bizarre hyperchromatic nuclei, areas of necrosis. Infiltration into voluntary muscle.

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among the hilar structures. A 9 by 3 centimeter portion of the upper lobe was congenitally fused with the apical portion of the lower lobe, requiring sharp division.

Gross examination of the lobe and microscopic examination of 7 large blocks of tissue showed only a single neoplastic nodule. This measured 3 by 8 by 12 millimeters. It was a spindle cell sarcoma (Fig. 12) exactly like that found in the thigh. Its center was necrotic and it appeared to have been growing only slowly.

The patient had an uneventful convalescence and was discharged from the hospital on October 9, 1942.

In January, 1943, a wide excision was made by Dr. Coller of the roentgen dermatitis area of skin and its contained ulcers and of the underlying fibrosed tissues. Microscopically, no neoplasm was found. In February, 1943, Dr. Henry Ramson covered the denuded area with a split thickness graft, 90 per cent of which lived.

The patient was last examined on October 16, 1946, 4 years after the lobectomy and 5 years and 8 months after the sarcoma of the thigh had been removed. He has no symptom or physical or roentgenographic (Fig. 14) sign of recurrence of the sarcoma. Flexion of the right knee is limited to 10 degrees because of a catching of the quadriceps tendon. He operates for approximately 5 hours on each of 5 days a week.

Recurrence (subsequent death) 1 year after lobectomy which was 10 years after removal of a carcinoma of the ovary

Dr Richard H. Sweet's patient No. 2 a woman, was found by x ray examination to have an irregular shadow in the right upper lung field which was diagnosed as bronchogenic carcinoma although a bronchoscopic examination showed no lesion. Dr Sweet removed the right upper lobe on January 26 1943. Microscopic examination of the tumor indicated that it was not primary in the lung. Further inquiry into the patient's history revealed that an oophorectomy had been performed for a cyst 10 years previously at another hospital. Microscopic comparison of the tumors of the ovary and lung showed that both were carcinomas of identical type. About 1 year after the lobectomy recurrence was found in the chest although not in the pelvis and the patient subsequently died.

Death 2 years after pneumonectomy which was 13 years after hysterectomy for carcinoma.

Dr P. S. Breszina and Dr G. E. Lindskog's patient was a woman of 65 years of age when she was admitted to the New Haven Hospital on April 5 1943, complaining of cough of 6 months duration and blood streaked sputum of 5 months duration. Thirteen years previously she had had at another hospital a subtotal hysterectomy and bilateral salpingo-oophorectomy carcinoma was diagnosed by gross inspection of the lesion but a microscopic examination was not made.

April, 1943 x ray films showed a 9 centimeter mass in the right lung at the hilar level. Bronchoscopy revealed puckering of the right main and upper lobe bronchi but a biopsy specimen did not show carcinoma. A pneumonectomy was performed on April 17 1943. There were no pleural adhesions and no enlargement or microscopic involvement of the mediastinal lymph nodes. The necrotic tumor which was in the upper lobe and had a very thin capsule was composed of columnar-cell glands. The pathological diagnosis was metastasis from adenocarcinoma of the uterus.

When the patient was last examined on September 29, 1943 5½ months after the pneumonectomy she was in good general condition and without evidence of recurrence in the pelvis, lung or elsewhere. The patient died at home or in another hospital with carcinoma in the liver on April 2 1945 2 years after the pneumonectomy.

Well 3 years after pneumonectomy which was 4½ years after resection of rectal carcinoma.

Dr Alfred Blalock's patient a man 54 years of age was admitted to The Johns Hopkins Hospital on September 10, 1943. In March 1939, a rectal carcinoma had been removed and in the following July the sigmoid was anastomosed to the remains of the rectum.

In October, 1942 the patient developed a cough and a cold which persisted for a month. Increasingly severe colds recurred for 7 months. During the following 3 months he had a persisting cough low-grade fever and loss of energy but no hemoptysis. Chest

roentgenograms made during this 3 month period were at first interpreted as showing only pulmonary infection of the right lower lung and later as an enlarging neoplasm.

Otherwise the past medical history and the family history are not relevant to the illness under consideration. On physical examination the right pulmonary base was dull to percussion and it descended fairly well during inspiration, breath sounds were normal. Examination of the abdomen, rectum, genitalia, and extremities revealed nothing of importance. On September 22 1943 Dr Blalock removed the right lung believing that the tumor mass was either a solitary metastasis from the rectal carcinoma or a primary bronchogenic carcinoma. Microscopically it proved to be an adenocarcinoma, presumably metastatic from the rectum.

When last seen in October 1946 3 years and 1 month after the pneumonectomy, there was no sign of recurrence. During the preceding 11 months the patient had had recurrent attacks of epididymitis, head and chest colds and one attack of pneumonia, from which he made a rapid recovery.

Death 10 months after pneumonectomy which was 4 years and 10 months after a thigh amputation for sarcoma.

Dr Duane Carr's patient a man of 26 years of age, had had a left thigh amputation for osteogenic sarcoma in January 1939. A routine chest roentgenogram in February 1943 showed a 3 inch round sharply defined mass of homogeneous density opposite the right pulmonary hilum. At this time there were no symptoms but in July 1943 a morning cough developed and a 3 ounce hemoptysis occurred and was followed by small hemoptyses or blood streaked sputum almost every day.

Dr Carr first saw the patient on November 3 1943. A thorough physical examination disclosed no evidence of any tumor except that in the right lung. Roentgenograms of all the long bones, the pelvis, spine and skull showed nothing suggestive of neoplasm. On November 9, 1943 Dr Carr removed the right lung. The tumor was found hard apparently encapsulated and had a diameter of 8.5 centimeters. The medial border of the tumor was engaged in the hilum. The pathological report stated that the tumor which was an anaplastic fibrosarcoma, contained areas of necrosis and appeared to have perforated the medial aspect of the capsule in several places.

The patient was doing part time office work in March 1944. Late April a small nodule appeared on his temple, enlarged and was removed by another surgeon. The patient developed a transverse myelitis and x-ray films of July 21 1944 showed destruction of the seventh and eighth thoracic vertebrae. The patient died about September 1944.

Death 5½ months after pneumonectomy which was from 15 months to 8½ years after various resections of urcinomatous papillomas of bladder and urethra.



Fig 15. Patient R. L. L. Roentgenograms of August 25, 1945 showing tumor in right lower lung posteriorly

Dr C. L. Deming's and Dr G. E. Lindskog's patient a man 54 years of age was first known to have bladder papillomas in 1931. In 1935 a biopsy showed probable malignancy and a later biopsy showed definite malignancy. Cauterization was carried out. Other papillomas were removed from the bladder and urethra during the next 2 or 3 years. Radium was used. The membranous and anterior urethra was excised on January 10, 1941 because of stricture and papillomas. Other papillomas were removed and in September, 1942, the end of the penis was amputated because of an infiltrating papilloma of the meatal mucosa.

Beginning in June, 1943, cough, chest oppression and pain developed. Roentgenograms showed a pulmonary tumor but no evidence of metastasis to bones. The bladder and posterior urethra showed no recurrence of papilloma. The right lung was removed on December 7, 1943. Microscopically the tumor of the upper lobe had a cellular arrangement similar to that of the tumors of the bladder and urethra. In February, 1944, there was evidence of metastasis to the right iliac crest and the patient died on May 22, 1944.

Death 2 years after pulmonary lobectomy which was 15 months after orchidectomy for a teratoma.

Dr Stuart W. Harrington's patient was a man who had had a left orchidectomy for a teratoma in another clinic in March, 1943. A solitary pulmonary metastasis was first noted by x ray in February, 1944. There were then no pulmonary symptoms. The tumor failed to respond to intensive x ray therapy and increased in size.

The patient was in very good general condition when seen by Dr. Harrington, who removed the lower lobe of the right lung on June 10, 1944. The

tumor was a fairly well delimited metastatic teratoma, 4 by 2.5 by 2.5 centimeters in size and contained a few areas of grade 2 adenocarcinoma.

The patient appeared well until 1½ years later when x ray examination showed a mediastinal mass which gradually increased in size in spite of x ray therapy. Death occurred 2 years after lobectomy.

Well 9 months after lobectomy which was 26 months after resection of a thoracic wall sarcoma.

Dr Richard H. Sweet's patient No. 3, a man in his middle fifties, had a fibrosarcoma excised from his thoracic wall on December 4, 1942. More than 2 years later a very small, lobulated shadow appeared by x ray in his left lower lobe, which was removed on January 31, 1945, on the assumption that the lesion was probably a single metastasis. Microscopically the pulmonary lesion was shown to be a fibrosarcoma. Nine months later the patient was apparently well. He failed to report for examination during the following year.

Well 15 months after lobectomy which was 3 weeks after nephrectomy for carcinoma.

Dr Richard H. Sweet's patient No. 4, a man, had had an abdominal nephrectomy for a renal cell carcinoma. Three weeks later in March, 1945, Dr. Sweet removed the left upper pulmonary lobe for a solitary metastasis. When last seen in June, 1946, 15 months after the lobectomy, the patient was apparently well.

Probable cerebral metastasis 6 weeks after lobectomy which was 2 months after nephrectomy for carcinoma subsequent death.

Dr Richard H. Sweet's patient No. 5, a man, had a right nephrectomy early in June, 1945, for a renal



Fig. 16 Patient H A B. X-ray film of January 5 1946, showing large tumor with clearly defined and lobulated margins.

cell carcinoma. A small rounded shadow was discovered in the left upper pulmonary lobe, which Dr. Sweet removed on July 30 1945. Approximately 6 weeks later the patient had a hemiplegia which his home physician assumed was due to a cerebral metastasis or possibly a cerebral embolus.

Well 23 months after double lobectomy which was 2 years and 5 months after amputation for a sarcoma of the thigh

R.L.L. No. 470,334, 29 year old man, a groundskeeper noticed a small tumor above his left knee 4 months following a kick by a horse in 1934. The tumor was removed and found to be a fibrosarcoma. In 1938, a recurrent tumor was excised and recurred again. When first seen at the University Hospital in October, 1941 it was fixed in the deep tissues above and mesial to the knee and measured 4 by 3 by 3 centimeters. This tumor was removed at another hospital.

The patient was readmitted on February 17 1943, 4 days after he noticed a 4 centimeter tumor mass fixed in the left popliteal space. This tumor which lay between the popliteal artery and the femur was removed on February 25 1943 by Dr. John Lawther. Microscopic examination was reported by Dr. C. V. Weller as showing a necrotic spindle-cell fibrosarcoma with many hyperchromatic nuclei and in some areas it was highly cellular—more cellular than it was in 1940. The neoplasm was found to extend beyond the area of excision. Apart from this finding the Tumor Conference had recommended before this operation was performed that amputation be car-

ried out if the sarcoma were found to have increased in cellularity. A high thigh amputation was performed on March 25 1943 by Dr. Lawther. Microscopically no neoplasm could be found from the examination of many sections.

The patient remained well and worked until April, 1945 except for traumatic fractures of his hand shortly before then. In April he developed an irritative cough with mucopurulent sputum. For a few days late in July these symptoms increased and a temperature of 104 degrees dropped rapidly with penicillin and sulfonamide therapy. On August 24, 1945 he was readmitted to the University Hospital. Physical examination indicated an extensive infiltration in the right lower posterior hemithorax. X-ray films showed a large intrathoracic mass with smoothly rounded superior and anterior borders, suggesting a metastatic lesion (Fig. 15). No other lesion could be seen in either lung. Chest x-ray films of October 29, 1940 and February 17 1943 had showed no abnormality. Films received from another hospital showed a right-sided lesion on April 30 1945.

Physical examination revealed no other metastases than the single one in the right lung. No pleural fluid was recovered by needle aspiration of the right lower chest. Bronchoscopy by Cameron Haight on August 27 1945 showed a tumor mass occluding the right intermediate bronchus but not involving the upper lobe bronchus. Microscopically a biopsy of this tumor revealed spindle-cell fibrosarcoma infiltrating beneath the respiratory epithelium (this and the subsequent pathology report were made by Dr. R. C. Wanstrom).

On September 4 1945, Cameron Haight removed the right lower and middle pulmonary lobes together with most of the intermediate bronchus into which a pedunculated portion of the tumor had extended but to the wall of which it was not attached. The tumor measuring 9 by 6.5 centimeters occupied the upper portion of the lower lobe. The lower and middle lobes were atelectatic. The entire pleural cavity was obliterated by adhesions. No enlarged lymph nodes were palpable in the hilum or mediastinum. Microscopically, the intermediate bronchus showed no neoplasm. The lung showed infiltration by spindle-cell sarcoma and the consequences of bronchial obstruction, i.e. bronchiectasis chronic purulent fibroid pneumoniae and organizing fibrinous pleuritis.

The patient was last seen as an out-patient on October 9, 1946 3 months after the double lobectomy and 3 1/2 years after the thigh amputation. He resumed his work as groundskeeper 5 weeks after the double lobectomy but did no heavy lifting for another 6 months. He has felt perfectly well, has gained 32 pounds and has had no cough, cold, or any illness. Chest x-ray films show no evidence of neoplasm.

Possible cerebral metastasis 8 months after lobectomy which was 4 years after excise of rectal carcinoma.

Dr. O. T. Claggett patient No. a man 50 years of age had an ulcerating grade 3 carcinoma of the mid and lower rectum removed in July 1941. In



Fig. 17 Patient I. L. M. Left, roentgenogram of March 18 1946 showing two tumors in right lung, the smaller one underlying the fifth costal cartilage. Right, x-ray film of June 27 1946 showing metastasis in left lung after right pneumonectomy.

November, 1945 he was found to have a tumor in the right chest which had not been present on roentgenologic examination 1 year previously. Bronchoscopy showed no bronchial lesion. A solitary metastasis in the lung was suspected. A right upper lobectomy was carried out by Dr. Clagett on November 29 1945. The lesion which was 4 by 3.5 by 2 centimeters in size, proved to be an adenocarcinoma grade 2. In July 1946 the patient was found to have the symptoms and signs of a possible cerebral metastasis.

Recurrence 9 months after partial lobectomy which was 2 years after nephrectomy for carcinoma

Dr. Richard H. Sweet's patient No. 6 had a nephrectomy for a renal cell carcinoma. Two years later his physician who had made frequent x-ray examinations because of the possibility of discovering an early solitary symptomless pulmonary metastasis found a small nodule in the right lower lobe. In December 1945 Dr. Sweet removed the small nodule together with a margin of adjacent pulmonary tissue by means of a segmental partial lobectomy. Nine months later a check up x-ray examination revealed numerous small round shadows throughout both lungs which were interpreted as multiple metastases, although the patient appeared to be reasonably well.

Death 5 months after pneumonectomy which was 6 years after resection of a rectal carcinoma

I.L.A.B. No. 386,405 49 years of age, a toolmaker was admitted to the University Hospital on January

14, 1946. Six years previously Dr. F. A. Collier had removed a rectal carcinoma by combined abdominal and perineal resection at another hospital. The patient was perfectly well until January 1944 when he developed a cough productive of 1 or 2 teaspoonsful of grayish sputum daily. During the year before admission he felt fatigued and 2 months before admission had a 15 cubic centimeter hemoptysis and developed a dull pain in his left shoulder extending to the elbow and the base of the neck. An occasional wheeze disappeared after expectoration. There had been no loss of weight.

The past medical and family histories were not significant. Physical examination including that of the lungs, revealed no abnormality of importance. Chest roentgenograms (Fig. 16) showed a large mass with clearly defined and lobulated margins in the left lower lung; no other lesion was seen in either lung and the hila were not enlarged. The thoracic cage and spine showed no abnormality.

The patient was bronchoscoped by Cameron Haight on January 14 1946. A lesion suggesting a primary bronchogenic carcinoma was obstructing the lingular bronchus; a biopsy specimen showed adenocarcinoma. On January 17 1946 Cameron Haight removed the left lung. The lesion approximately 8 centimeters in diameter occupied the lingular and axillary segments of the upper lobe and the anterior segment of the lower lobe. The lesion was firmly adherent to a 6 by 8 centimeter area of the pericardium but there was no gross evidence of pericardial invasion. The tumor in the lung contained large areas of necrosis. Dr. W. A. Stryker of the Depart-



Fig. 18. Patient V. A. B. X-ray film of October 3, 1946, showing triangular shadow and 3 small nodules in right lung.

ment of Pathology reported an adenocarcinoma metastatic suggesting metastasis from the rectal carcinoma. The cancerous infiltration extended into the adventitia of a number of blood vessels. One mediastinal lymph node contained carcinoma cells and two others did not.

The patient was discharged on February 1 but returned frequently as an out-patient, and for 3 weeks in April as an in-patient complaining of dyspnea and pain in both the right and left sides of the chest. Spine x-ray films showed no lesion. The mediastinum was displaced only slightly toward the left. On April 20, 1,000 cubic centimeters and on April 23, 1,300 cubic centimeters, of slightly cloudy fluid were aspirated from the right pleural cavity with great relief of dyspnea. No carcinoma cells could be found in either specimen. The dyspnea recurred on April 25 but no more fluid could be seen by fluoroscopy or recovered by needle. Although a metastatic lesion could be seen in the April x-ray films the occurrence of the right-sided pleural fluid dyspnea, and right-sided thoracic pain made the presence of metastasis reasonably certain. The patient died in June 1946. There was no autopsy.

Well 3 weeks after lobectomy which was 4 years after amputation for a sarcoma of the os calcis

Dr. O. T. Clagett's patient No. 2, a man 55 years of age, had an amputation for a grade 1 chondrosarcoma of the right os calcis in October 1941. He returned to the Mayo Clinic in January 1946, with a lesion in his right chest, which was suspected of being a metastasis. Dr. Clagett removed the right upper

pulmonary lobe on February 19, 1946. The lesion was found to be a grade 1 osteogenic sarcoma and measured 12 by 8 by 5 centimeters. The patient was discharged on March 12, 1946.

Recurrence 7 weeks after pneumonectomy which was 5 months after removal of a sarcoma of the leg

J. L. M. No. 386,608, a 49-year-old Philippino man, a student, was first admitted to the University Hospital on March 15, 1946. In March or April 1944, a corn grain sized movable nodule was removed from the tissues over the head of the left fibula. The tumor recurred and in October 1944, it was 3 centimeters in diameter and was removed. In July 1945, it recurred, grew rapidly and was partly removed. An aspiration biopsy was carried out in September showing sarcoma. In October 1945, the lesion was apparently completely excised. Neither fluoroscopy of the chest in November nor chest x-ray films at the Chicago Tumor Institute and at the University of Michigan Health Service in January 1946 revealed any abnormality. Roentgenograms of February 13, 1946, showed two small rounded nodules in the right mid and lower lung fields, the left lung and the hilum were clear. By March 18, the lesions had definitely increased in size.

At the time of his admission he said that for a few months he had had a dry cough, the occasional expectoration of mucus, increasing dyspnea and, recently, some bloody expectoration. Since April 1945, he had had malaria and measles. He had been severely malnourished during the Japanese occupation of his homeland. His weight on March 15 was 108 pounds, his best weight was 126 pounds.

The patient did not appear ill. His temperature was normal and his blood pressure 108/70. There were no abnormal physical signs from the lungs (Fig. 17). The cervical, axillary and inguinal lymph nodes were not enlarged. No mass or enlarged organ was palpable in the abdomen. There was no palpable or roentgenographic sign of recurrence of the leg tumor. There was no evidence of any metastasis except those in the right lung.

The right lung was removed on March 25, 1946, by Dr. George R. Minor. The upper and middle lobes were free of adhesions but the lower lobe was covered by avascular adhesions. Only small anastomotic lymph nodes were present in the hilum. The diameter of the upper lobe metastasis was 2.5 centimeters and that of the lower lobe 2 centimeters. The tumors were highly cellular spindle-cell sarcomas with osteoid matrix. There were marked pleomorphism and many division figures. Tumor thrombi or emboli were present in veins, and masses of neoplasm in bronchi. This report of Dr. W. A. Stryker of the Department of Pathology states that the primary neoplasm was probably osteogenic.

The patient was discharged on April 9. Check-up roentgenograms on May 17 showed for the first time a rounded lesion in the lower left lung, measuring 2 by 3.5 centimeters. On September 10 it measured 5 by 7 centimeters. The lesion had failed to respond

to x-ray therapy. 600 roentgens having been given to each of two fields on May 22 and 23. The patient was seen for the last time on September 25 when he appeared cachectic. He was dyspneic and had great pain in the region of the thyroid cartilage on swallowing or turning his head toward the left. Almost certainly he will soon die from progression of his metastases.

Well 3½ months after lobectomy which was 6 years after removal of carcinoma of colon

Dr Paul C. Samson's patient No. 1, a man now 69 years of age, a bank employee, had a right-sided colectomy for carcinoma in mid 1940. A chronic cough of 30 years' duration increased late in May 1946 and during the next week blood was expectorated. There was no loss of weight or chest pain. X-ray films showed a rounded mass 3 inches in diameter in the left lower pulmonary lobe. Bronchoscopic biopsy showed only inflammatory tissue. The mass increased in size during the period of a month. On July 12, 1946, the left lower lobe was removed. Lobectomy was chosen instead of pneumonectomy because (1) frozen sections of the hilar lymph nodes showed no malignant cells, (2) the tumor was in a peripheral location and (3) the patient was quite elderly. Several degenerated areas in the soft tumor contained mucoid material; the lining was composed of highly differentiated mucoid adenocarcinoma with papillary ingrowths, microscopically almost identical with colon carcinoma.

The last check-up examination was on November 1, 1946, when there were no symptoms or fluoroscopic evidence of recurrence.

Consolidating 1 month after pneumonectomy which was 5½ years after nephrectomy for carcinoma

V.A.B. No. 254,460, a man of 53 years of age, a machinist, had a left-sided nephrectomy by Dr. Reed Nesbit for a renal cell carcinoma on April 5, 1941, following 2 weeks of symptoms and a single episode of hematuria 2 years before. Roentgenograms in 1941 showed no sign of a pulmonary neoplasm. In 1944 he had symptoms suggesting the possibility of coronary disease but this diagnosis was not established by examinations.

In May 1946 the patient began to cough, had a fever of 102 degrees and pain in his right chest. Bronchial pneumonia of the right mid lung was diagnosed elsewhere. Improvement with penicillin was rapid and x-ray films during the next month showed a definite decrease in the area of pulmonary infiltration. Roentgenograms of July 16, 1946, showed a smoothly margined triangular area in the right upper lung (Fig. 18). A month later there was almost no change in this shadow but the films of October 3 showed an increase in parenchymal density.

The patient was admitted to the University Hospital on October 18, 1946. No physical findings of

importance were found except in the region of the pulmonary lesion. No mass was felt in the renal regions, the blood pressure was 140/86, but there was no evidence of cardiac disease and an electrocardiogram was not outside the normal limits.

Bronchoscopy was performed by Cameron Haight on October 21; no neoplasm could be seen as was also so when bronchoscopies were carried out on July 7, August 23, and October 4. Haight removed the right lung on October 25, 1946. The upper lobe was densely adherent anterolaterally. A 5 centimeter diameter yellowish neoplasm was present centrally in the upper lobe. A 1 centimeter nodule was present in the apex of the lower lobe and there were several similar nodules in the upper lobe. Bronchiectases occupied that part of the upper lobe whose bronchus was obstructed by a neoplastic nodule. A 1 millimeter nodule was removed from the parietal pleura near the neoplasm. Dr. A. J. French of the Department of Pathology reported this as being a malignant neoplasm, probably carcinoma, but control sections did not show any malignancy. Dr. R. C. Wanstrom reported that the pulmonary neoplasm was a widely infiltrating metastatic hypernephroma; there was no involvement of the bronchial lymph nodes.

Two days after operation a sudden jump in the pulse rate to 170, for which no extracardiac explanation was available, caused the making of an electrocardiogram which showed marked notching of the P waves suggesting an auricular change. Two days later an electrocardiogram showed auricular flutter with a ventricular rate of 188 and an auricular rate of 376 or possibly paroxysmal tachycardia with a 1 to 1 response. The following day after digitalis the pulse rate was 108, the electrocardiographic diagnosis was unchanged. All the electrocardiographic interpretations were made by Dr. Frank N. Wilson. On November 25, 1946, 1 month after operation the temperature was normal, the pulse approximately 110 and the patient was in a moderately satisfactory general condition. Several days before when the digitalis dosage was temporarily reduced the auricular fibrillation returned. This case is added to the series so soon after operation only because the series includes all cases known to us in which both the primary and initial metastatic pulmonary lesions have been removed. The ultimate prognosis seems poor because there were several nodular neoplasms in addition to the chief neoplasm in the right lung.

SUMMARY

1. The appearance of a solitary metastatic lesion in a lung months or years after the removal of a primary extrapulmonary sarcoma or carcinoma is far from rare.

2. Only 5 adequate case records showing the results of the resection of the metastatic pulmonary lesion have been published. Nine teen additional records are included in this article.

The records of D. Samson, second and third patients, both of whom were operated upon recently, were not available when this article was completed.

3 One of the 24 patients died as a direct result of the pneumonectomy or lobectomy operations. Eleven have had recurrence of the neoplasm and 12 have had no recurrence

4 Among the 12 patients with no recurrence 8 are apparently well 12 7 6 5 4 3 $1\frac{1}{4}$ and 1 years respectively after the pulmonary resection operations. Four patients were operated upon too recently for evaluation

5 Six of the 8 sarcoma patients but only 6 of the 15 carcinoma patients (excluding the 1 who died as a result of operation) are apparently free of recurrence. Two of the 6 sarcomas and 2 of the 6 carcinomas, however were operated upon less than 10 months ago. Four renal cell carcinoma patients (including 1 operated upon a month ago) are free of recurrence. Only 2 other carcinoma patients are free of recurrence one 3 years and the other $3\frac{1}{2}$ months after pulmonary resection

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THE DIAGNOSIS OF ABDOMINAL TRAUMA IN WARFARE

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MANY papers have been written on the treatment of the abdominal gunshot wound but the diagnosis has received less attention. In my opinion a careful preoperative examination and diagnosis in these cases is amply justified by the number of lives saved. During the first 6 months of 1944, 560 laparotomies were performed on British battle casualties in Italy. A visceral lesion was not found in 66 (12%) of these cases and of these 66 29 per cent died the unnecessary laparotomy being a major cause of these 19 deaths. During the same period 50 laparotomies (9% of the total cases) were performed for a wound of the liver or kidneys only. While in some of these full abdominal exploration was necessary for the control of hemorrhage, I would emphasize that with a more accurate diagnosis laparotomy should not have been necessary in the majority. A similar high incidence of negative abdominal exploration has occurred in other theaters of war (Table I). The importance of avoiding an unnecessary laparotomy in battle casualties is absolutely imperative; the attitude of "let's look and see" has no place in field surgery until a full clinical examination and sound diagnosis has been made.

This paper is based on 172 cases in which patients were admitted to and treated at an advanced surgical center in Italy. For about half of them the location was a field dressing station where no x-ray apparatus was available for the remainder a casualty clearing station with its added facilities including an x-ray plant. The average time at which operation was performed was 6.4 hours after wounding. All patients were retained for a minimum of 10 days the majority for longer but the follow-up has been incomplete. However no patient was evacuated until on a full diet his

TABLE I.—THE INCIDENCE OF A POSSIBLY UNNECESSARY LAPAROTOMY

	T. total laparotomies	N. visceral lesion No. Per cent	Liver & kidney only No. Per cent
Opificio W. R. Western Desert 942-1943	47	4 7	35 53
Edwards, H. C. and Stead, G. Italy 441, Jan. June	560	86 15	50 8.9
Forrest, A. E. 1st Army Group 944-1945	439	740 17	880 20.3

bowels acting regularly and the peritoneum clinically free from residual abscesses. The only exceptions were 3 patients with pelvic abscesses who had to be evacuated before the abscesses had resolved and these are known to have recovered.

All the 172 admissions showed marked and definite clinical abdominal symptoms and signs and in all a diagnosis had been made by a medical officer of a penetrating wound of the abdomen. Of these 172 patients 6 (3.5%) were brought in dead or were moribund on ad-

TABLE II.—ANALYSIS OF 166 CASES WITH DEFINITE ABDOMINAL SYMPTOMS AND SIGNS

	Cases
1. <i>Laparotomy performed</i> (Deaths 39)	113
a. Necessary (wounds of the hollow viscera or wounds of the solid viscera in which hemorrhage necessitated laparotomy)	103
b. Unnecessary	1
Liver or kidney only	0
Retroperitoneal tissues	2
2. <i>Laparotomy not performed</i> (wound excision only) (Deaths 1)	53
a. Extraperitoneal hematoma	14
b. Thoracoabdominal or abdominal wound with a hemoperitoneum (liver or kidney only)	0
c. Chest wound with abdominal signs	7
d. Buttock wound with a fractured pelvis	6
e. Kidney wound (without a hemoperitoneum)	4
f. Localized peritonitis in a wound more than 36 hours old	4
g. Extraperitoneal wound of the bladder	3
h. Spinal wound with paraplegia and hyperesthesia	3
i. Blast injury	2
j. Colon (extraperitoneal only)	1

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mission and died at a very early stage of resuscitation the remaining 166 (96.5%) were operated upon.

It may be seen with the aid of Table II that

a. In 113 patients a laparotomy was performed, and in 53 a wound excision without abdominal exploration.

b. Over half of these patients had other wounds in addition to those involving the abdomen, and in 50 per cent these were of first priority degree in themselves.

c. There were 40 deaths in this series.

d. There were 39 deaths among the 113 patients who had a laparotomy and only 1 death among the other 53 patients in whom I elected not to open the abdomen.

e. Of the 39 patients who died after laparotomy 17 had associated first priority lesions such as extensive muscle wounds, gas gangrene, traumatic amputations, major fractures cerebral wounds, etc. 14 had associated minor wounds in 8 the abdominal was the only wound.

f. Unnecessary laparotomies were performed in 11 of which 9 (8% of the total laparotomies) were for liver or renal wounds, and 2 (2% of the total laparotomies) were for injuries to the retroperitoneal tissues. The criterion taken for an unnecessary laparotomy has been one in which nothing except exploration was done, and in which recovery followed.

g. Of the 53 patients treated without laparotomy 13 (25%) had intraperitoneal lesions and of these every one recovered. The remaining 40 (75%) had wounds of the structures in close relationship to the parietal peritoneum of these one, a spinal wound with paraplegia and abdominal hyperesthesia, was the only patient who died.

h. In 34 patients there was a wound of the liver either with or without an associated visceral lesion. In only one of these was surgery necessary for the control of hemorrhage.

i. In 22 patients there was a renal wound either with or without an associated visceral lesion. In only 3 of these was nephrectomy necessary.

The effects of other wounds on the mortality of abdominal surgery in war is marked. In a series published by Lieutenant Colonel Guy Blackburn and myself the mortality for abdominal wounds without other first or second priority wounds was 25 per cent but in association with these wounds it was 42 per cent.

DIAGNOSIS

It is essential to see the wood as well as the trees, by which is meant that a general survey of the patient is the first consideration. What is the state of the peripheral circulation?

What is the blood pressure and the pulse pressure? What is the pulse rate?

Practically every patient has already been given morphia to allow him to undertake the journey back. With increasing experience and in spite of a considerable reduction of abdominal pain and rigidity an accurate diagnosis can still be made in these heavily morphinized patients.

Further factors to be considered are

1. The state of dehydration of the patient. The majority of patients with war wounds of the abdomen are dehydrated when seen.

2. Resuscitation usually takes a matter of some hours, which enables the surgeon to review the case on more than one occasion. This is important because the clinical picture varies from hour to hour. And I would here mention that a valuable diagnostic pointer is given by the fact that most patients with out a lesion of the alimentary tract either do not require resuscitation or respond rapidly. An exception may be made by cases with severe hemorrhage or associated other first priority wounds.

3. Age. In this series age ranged from 17 (that of a German prisoner of war) to 40.

4. Fighting fit soldiers usually have an abdominal wall of high muscle tone which in itself is a trap for the unwary.

5. Owing to the mixed racial composition of the Allied Armies in Italy marked differences of temperament had to be evaluated.

There is no difficulty of diagnosis in many patients they may show an abdomen with the general rigidity and tenderness, the absence of respiratory movements and the silence on auscultation of general peritonitis or there may be a prolapse of viscera through the wound. The problem arises in the less obvious case and before discussing individual lesions there are two physical signs of fundamental value in all cases. These are (1) an efficient clinical estimate of the wound track and (2) auscultation of the abdomen.

A CLINICAL ESTIMATE OF THE WOUND TRACK

A clinical estimate of the wound track can be obtained by the following

1. *The preoperative appearance of the wounds* including the relationship of the exit wound if present to the wound of entry and a statement from the patient as to the posture he was in when hit. This latter is important and explains many unusual wound tracks. It has

been my experience that missiles take a straight course from one point to another unless deflected by bone. I well remember a patient with a wound just above the right inguinal ligament and the foreign body lying in the right ischium. At operation the only lesion found was a laceration of the hepatic flexure of the colon, and subsequent inquiry elicited the fact that he had been bending to adjust his boot when wounded.

2 *The usual routine clinical examination*, particular attention being paid to those symptoms and signs of localizing diagnostic significance.

3 *Rectal examination and catheterization* have been of importance in tracing the track of many missiles.

4 *A radiological examination*, when available to locate foreign bodies and to demonstrate fractures. This has been of most value in wounds of the upper abdomen and lower chest where the foreign body may be located in the liver or thorax, wounds of the buttock where the foreign body may be retained in a fractured ilium, and wounds of the extraperitoneal regions.

5 *The findings at wound excision* which has been performed in every case. When patients are fit for the theater and whether laparotomy is to be performed or not. I first of all excuse every wound which might have penetrated the peritoneum. *This is essential and in my experience exploration of the wound track in the operating theater has often been the deciding factor for or against opening the abdomen.*

AUSCULTATION OF THE ABDOMEN

It is important to ascertain the presence or absence of peristaltic sounds. These may be mimicked by sounds due to a fluid gas mixture in the bowel itself particularly when the gut is distended. These can be reproduced by rolling the patient and listening at the same time but with experience there is no difficulty in differentiating them from peristaltic sounds. Auscultation of the abdomen has been performed on every case in this series, when necessary on more than one occasion and for 2 or 3 minutes at a time until the presence or absence of peristalsis has been established beyond doubt.

In an analysis of abdominal auscultation in a total of 166 cases, the following was noted:

In the presence of a lesion of a hollow viscus peristalsis was present in 6 absent in 89. In the absence of a lesion of a hollow viscus peristalsis was present in 70 and absent in 1.

Thus in only 1 per cent of those patients without a hollow visceral lesion was peristalsis absent in this patient who had a large posterior extraperitoneal hematoma the abdomen was silent throughout. Laparotomy in this case was one of the two unnecessary laparotomies performed for extraperitoneal hematomas. However in those patients with a lesion of a hollow viscus, 94 per cent had no peristaltic sounds. In 2 patients with small intestinal wounds 3 patients with wounds of the colon and 1 intraperitoneal wound of the bladder peristalsis was heard. In these there was little leakage from the bowel and minimal peritoneal soiling and I am convinced that peristalsis is only absent when the activity of all the intestine has been inhibited by a general peritoneal soiling although before this a local silence occurs immediately around the perforation. The following patient seen in consultation with Lieutenant Colonel A. J. Latchmore, R.A.M.C. illustrates this point well.

Patient had received a machine gun bullet wound 2½ hours before admission. The bullet's entry was anteriorly just to the left of the midline at the level of the sixth rib and its exit at the level of the 10th rib in the posterior axillary line of the same side. The abdomen was tender but soft peristalsis could be heard as the patient was very distressed he was sat up. Immediately he complained of great abdominal pain, so after 5 minutes he was laid down again. On examination the abdomen now had generalized rigidity and tenderness with complete silence on auscultation. At operation a large tear of the stomach was found. It appears that when this patient sat up his gastric contents, which previously had been localized to the upper left abdominal quadrant were spread rapidly over his entire peritoneum thereby producing the sudden change of abdominal physical signs.

Therefore I submit that the absence of peristaltic sounds confirmed and reconfirmed is a positive indication for laparotomy but that the presence of peristaltic sounds is only a valuable guide toward and not a positive indication for conservative treatment.

FURTHER DIAGNOSTIC POINTS

Certain points have been of particular help in the various case groups.

Extrapertoneal hematoma When in the anterior abdominal wall the rigidity and tenderness have been localized to the wounded region and occasionally there is local surgical emphysema due to respiratory movements sucking air along the wound track, the foreign body may be palpable but if the wound is through and-through as it often is in the loin the possibility of a rupture of the intestine even with an intact peritoneum must be considered if the missile is a bullet. Occasionally these hematomas are large as when the deep (inferior) epigastric artery has been injured.

Posterior extraperitoneal hematomas have been diagnosed by the mild rigidity if light palpation is employed and by the presence of peristaltic sounds. Tenderness, however may be extremely great over the localized area of the hematoma, and peristaltic sounds are themselves sometimes faint and require patience to detect. In these cases the possibility of missing an extraperitoneal tear of a fixed portion of the intestine has been avoided by a careful wound excision and exploration. In cases seen late ileus distention may be marked.

In pelvic extraperitoneal hematomas rectal examination both digitally and with a proctoscope has been invaluable for while tenderness may be deceptive due to extraperitoneal bruising it is by this measure alone that a peritonitis of the rectovesical pouch can be diagnosed before it has spread to the general peritoneal cavity these cases are usually associated with buttock wounds and fractures of the pelvic bones. On two occasions wound and wound track excision and exploration were followed by an extraperitoneal exploration above the inguinal ligament and removal of a foreign body from the pelvic fascia in one of these the termination of the descending colon was lacerated extraperitoneally and suture with drainage but without laparotomy was successful.

Wounds of the liver It has been my experience that of 34 such patients in only one was surgery necessary for the control of hemorrhage. These cases of simple hemoperitoneum form a large and important group of abdominal war wounds, because they are one of the

few intraperitoneal lesions in which laparotomy is not necessary. An x ray film is invaluable when the foreign body has been retained, as an adequate estimation of the wound track may be impossible without one. In the majority of the unnecessary laparotomies of this series the course of the missile could not be estimated because an x ray machine was not available. The presence of some abdominal wall movement with respiration, of a mild rigidity on light palpation and of peristalsis by abdominal auscultation have all aided the diagnosis. In no case where the liver was the only lesion was peristalsis absent although in several patients a large and diffuse hemoperitoneum was present. These patients have been watched very carefully for further bleeding but in only one case did this necessitate operation. I would remind you of the ease with which hemorrhage from the liver may be restarted by the laparotomy itself and in some cases of the extreme difficulty of controlling it again.

Wounds of the kidney War wounds differ in many respects from the closed traumatic injuries of civilian practice. In the former one does not see the large swelling of the perinephric tissues nor does one meet the typical pain and colic at an advanced surgical center although the last named has been noted during convalescence. On palpation local tenderness and rigidity can be elicited. Catheterization is essential for without exception in this series hematuria has been present. At operation wound excision and exploration will show the track of the missile and the opportunity is taken for accurate palpation of the kidney. As a result of this palpation an estimate can be made as to the necessity for nephrectomy and it has been my experience that the majority can be treated expectantly. In this series of 22 renal wounds only 3 required immediate nephrectomy. It is possible that in some cases removal of the kidney is done at a later date but such patients are better fitted then to stand the operation. Various reconstructive operations have been recommended for these renal lacerations, but in field surgery they are unsafe and the immediate results of simple drainage appear to be very satisfactory.

Wounds of the ureter I myself have met no case of injury to either ureter distal to the renal pelvis.

Bladder wounds are either intraperitoneal or extraperitoneal. The fact that the bladder has been injured rarely presents difficulty in diagnosis. Occasionally due to a wound of the abdominal wall it may be impossible to tell by abdominal examination whether the bladder is full or empty. In these cases a rectal examination and catheterization will solve the problem. But when the bladder is the only visceral lesion an intraperitoneal rupture may not be found before the wound has been explored. Suprapubic cystostomy has to be performed on both groups and this procedure combined with drainage of any extraperitoneal urinary extravasation provides an ideal opportunity for assessing the damage.

Chest wounds with abdominal signs If there is only an entry wound present in the thorax an x ray film is invaluable to determine the relationship of the foreign body to the diaphragm. With the portable x ray apparatus available in forward areas a lateral film although essential, is unsatisfactory. Screening is impossible and reliance has to be placed on the anteroposterior film alone. On the right side this is of little moment because if the foreign body is just below the diaphragm it will be in the liver. However on the left side the diagnosis may have to rest on a full clinical examination. If there is a continued absence of peristalsis the foreign body has injured a hollow viscus. When the chest alone is injured there is usually some abdominal breathing, abdominal tenderness is slight and rigidity located only on the side of the chest wound. It is generally mild, relaxes with respiration and tends to abate with rest. A correct diagnosis should be possible in all these cases.

Wounds of the buttocks These form one of the more common wounds of this war. When the track penetrates the peritoneal cavity there is a considerably higher mortality than with abdominal gunshot wounds via other routes (1). Unusual wound tracks are commonly encountered from this region usually due to posture and to the fact that the buttock forms a pivotal point between the trunk and

lower limbs. As a result it is not unusual for the foreign body to be found as low as the knee or as high as the shoulder. An x ray film is of obvious importance for the location of these missiles and when the foreign body has fractured the pelvis the film must be carefully inspected so that bone fragments which may have been driven into the peritoneal cavity are not missed. I have had a case in which the colon was perforated by a spicule of ilium. These wounds should be under very strong suspicion until a very careful clinical examination has excluded damage to the alimentary or urinary tracts. The importance of localized abdominal rigidity, rectal examination, proctoscopy and catheterization has already been stressed. Gas gangrene is an ever present danger and a thorough wound excision must be carried out.

Spinal wounds with abdominal hyperesthesia Such patients if seen early present no special difficulty of diagnosis. It is those patients seen late when abdominal distention has occurred who present the problem. Should a laparotomy be performed? What are the points of differential diagnosis? The ileus distention of spinal wounds comes on much sooner than the distention of general peritonitis. In a spinal cord lesion tenderness and hyperesthesia are localized to the segment just above the paralyzed level, on the other hand rigidity like pain is a sign of doubtful value in the diagnosis. Peristalsis may be very faint in these cases but in this series it has always been present. Paraplegia, because of its possible association with an abdominal visceral lesion has no value in the differential diagnosis. Priapism has been noted in these cases but I have never seen it with an extraperitoneal hematoma.

Late wounds Patients seen more than 36 hours after visceral perforation differ but little from similar disasters of civilian practice. Four patients had lain on the battlefield for long periods and upon admission showed localized abdominal signs, findings similar to that presented by an appendix mass. The lesions were thought to be of the colon only and they were treated without laparotomy. Subsequently 3 developed a local abscess which required drainage and of these 2 had a temporary fecal fis-

tula. In this series there were a further 8 late cases all admitted with advanced generalized peritonitis and desperately ill. Of these 3 were opened and closed again immediately as their general condition would not stand the multiple visceral repairs necessary. In the 5 remaining all their abdominal lesions were surgically treated but 3 of these died later. The value of massive doses of plasma in these cases of general peritonitis is enormous. In my opinion this therapy counteracts the circulatory failure which is due to plasma loss from the inflamed peritoneum, the surface of which is equal to that of the whole body.

Extrapertoneal wounds of the colon In patients seen early an extraperitoneal wound of the colon can be diagnosed only at wound excision.

Blast injuries Naval warfare provides far more cases of abdominal blast injury than does military. They may present an extremely difficult diagnostic problem and I want to quote in detail the 2 cases of this series.

The first man, a gunner, had a cannon shell wound of the back and left chest; there were very marked abdominal signs including absence of peristaltic sounds. Resuscitation was commenced, and later on one occasion only I heard very faint peristalsis. In view of this no laparotomy was performed, the chest wound only being treated, and he recovered.

I have no doubt that his abdominal signs were due to the blast effects of the explosive cannon shell.

The second case, an officer, was riding when his horse trod on a Teller mine. The horse was blown to pieces but the officer escaped with severe multiple injuries, and he was in abdominal distress. When I saw him 3 hours after injury, there was a traumatic amputation of one leg at the knee, a compound fracture of the opposite femur, generalized multiple wounds, and his abdomen was rigid and silent. His condition would not have allowed excision of all the small wounds, several of which might have penetrated into the peritoneum. After resuscitation, peristalsis was heard and in view of this, I decided not to perform a laparotomy. I performed an amputation of one leg, excised the wounds and splinted the other and he recovered. A laparotomy in addition most certainly would have killed him.

In neither of these cases was an x ray machine available, and the presence of perforated ear drums was taken as evidence that blast lesions had occurred.

Patients moribund on admission Six patients (3.5% of the total) were dead or moribund on admission: 3 from severe multiple injuries, 2 from thoracoabdominal wounds and only 1 from an abdominal wound alone. The thoracoabdominal wounds are of interest because there were 2 of the 3 cases of *diaphragmatic hernia* seen; both had extensive herniation and the diagnosis was easy as the abdominal viscera were presenting through the thoracic wound. The third patient recovered and the diagnosis was made by the presence of peristalsis within the chest, the herniated viscera not being perforated.

I have already emphasized earlier in this paper the extreme difficulty that many cases cause in diagnosis. These patients reach an advanced surgical center heavily morphinized and often without abdominal pain. Because of this an abdominal lesion may be completely missed, a possibility which must be continually guarded against. The problem arises when the wound of entry is at some distance from the abdomen and is most commonly found in association with a wound of the thigh, buttocks, or even the neck. The following 2 cases illustrate some of the difficulties.

An Indian soldier was brought to me with the diagnosis of prolapsed viscera. When I saw him it was obvious that an intact peritoneum was ballooning through a gutter wound which had divided both recti abdomina. In spite of this he had the physical signs of a perforated hollow viscus. At operation excision of this gutter wound confirmed the presence of an intact peritoneum, and it was only then that I discovered a small wound of the right loin. This wound penetrated the peritoneum and the small intestine was perforated.

A German medical officer was wounded by a machine gun bullet, which had fractured his right shoulder and produced a right hemothorax. Although a qualified doctor he made no complaint of abdominal pain. The availability of an apparatus enabled an x ray film of the chest to be taken, and it was only when this demonstrated the bullet to be below the diaphragm that the possibility of an abdominal lesion was considered. Although he still complained of no abdominal pain, clinical examination showed in point of fact that he had a perforated hollow viscus. At operation I removed the bullet from the epigastrium and sutured a laceration of the fundus of the stomach.

On the other hand pain in the legs may be the major symptom, when the lumbar plexus

has been involved in association with visceral damage

Some of the symptoms and signs which are standard in civil practice have been of little value in the gunshot wound due to a number of factors including the longer time lag and the more disturbing evacuation. I have already mentioned the variability of abdominal pain which may be masked by morphine and shock or overshadowed by the pain of other major wounds. In some cases patients have complained of abdominal pain when peritoneal penetration had not occurred. For example the pain of a retroperitoneal hematoma may be very great. The shoulder tip pain of diaphragmatic irritation has been noted in only 8 patients although a leading question has been put to every English-speaking patient. Except with spinal cord lesions morphine had rendered valueless the testing for abdominal hyperesthesia.

In civilian practice rigidity is a sign which has great significance but its value has been considerably less in the gunshot wound and an entirely false diagnosis may be made if too great reliance is placed upon it. The boardlike rigidity of a perforated peptic ulcer although it may occur is uncommon. Rigidity too may be marked with wounds of the chest, abdominal wall or buttocks while in early cases with intestinal perforations it may be absent.

Abdominal percussion will demonstrate shifting dullness on the other hand the sign of absence of liver dullness is valueless. Four cases of simple liver wound showed a diminution of liver dullness presumably due to entry of air along the wound track. For the same reason an x ray film of the abdomen to show gas between the liver and the diaphragm has been of no help. Vomiting may occur in all wounds and unless the vomitus has distinguishing characteristics such as the presence of blood the diagnostic value has been slight. Bleeding per rectum is of obvious importance but bowel actions and the passage of flatus have been without significance. Examination has often revealed a dry furred tongue without an abdominal wound and urine analysis beyond a search for blood has not been performed.

PLANNING THE LAPAROTOMY INCISION

Correct planning of the laparotomy incision is invaluable. While the greater part of the small intestine can be examined through all abdominal incisions this is not so of the other viscera. The most reliable sign for planning the incision has been an estimate of the wound track but other signs such as hematuria, the vomiting of blood and localized rigidity and tenderness have been of value. In wounds of the right or left colon an oblique flank incision saves further soiling of the general peritoneal cavity and allows inspection of the adjacent viscera. The importance of a correct assessment of all the diagnostic facts before siting the incision and the difficulties encountered through ignoring them are well exemplified by the only case in which I missed a visceral perforation.

I operated upon a British soldier 3 hours after wounding. There were 3 penetrating wounds of the abdomen centered around the umbilicus, with the signs of general peritonitis and a history of hematemesis. I performed a laparotomy through a right mid-paramedian incision sutured 8 perforations of the small intestine, and exteriorized a lacerated loop of transverse colon. I found no obvious lesion of the stomach. This man died after 2 days from general peritonitis and postmortem examination revealed a high perforation of the stomach.

In this case if greater attention had been paid to the history of the vomiting of blood an upper paramedian incision would have been made and the gastric perforation found and closed.

Before I conclude my remarks on diagnosis there are two further points requiring discussion.

First Brigadier Charles Donald has suggested making a small abdominal incision and inserting a swab on a holder into the pelvis. If it is blood-stained then laparotomy is performed. I feel that this does not go far enough because it does not distinguish between a simple hemoperitoneum which might be treated without laparotomy and a perforated hollow viscus which requires an immediate laparotomy.

Second it has been stated that a through and through wound between the linea semi lunares does not penetrate the peritoneum. While this is probably true for fit soldiers I

have had a case of an Italian civilian female in which such a wound produced multiple intestinal perforations due undoubtedly to her pendulous abdominal wall

CONCLUSION

The mortality from unnecessary laparotomy demands the greatest care and accuracy in the diagnosis of the abdominal gunshot wound. Although I have stressed the great value of abdominal auscultation and wound exploration no single sign or group of signs should be relied on without a full and careful clinical examination of the patient as a whole

Finally where a genuine doubt exists after repeated examinations it is advisable to open the abdomen but these exploratory laparotomies should rarely be necessary

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PLASMA CLOT GRAFT OF PERITONEUM FOR PERFORATIONS OF STOMACH

Preliminary Report of an Experimental Study

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THE purpose of this study was to see if it were possible to close a perforation of the stomach with a graft of peritoneum by substituting plasma clot for sutures. Occasionally the surgeon finds a perforated peptic ulcer with extensive induration or a perforated ulceration through a carcinoma so extensive that he is at a loss as to what to do. This type of perforation usually does not lend itself to suture closure because of induration. He might attempt primary resection in the face of infection but he knows how greatly this increases the risk to the patient. He has attempted in the past to cover the perforation with neighboring organs but this step frequently fails to give a tight closure and the patient expires from a peritonitis despite treatment. However if he could tide his patient over the critical period of perforation he could get him into better physical condition for more extensive surgery if it is indicated later on. The method that will be described is intended for this purpose to tide the patient over the acute period of perforation so that the peritoneum can more easily combat the infection due to leakage as well as stop the leak for the time being. No evidence has thus far been obtained on human patients since no attempt has yet been made in this direction. The present paper is only a preliminary report of the more extensive investigation that is contemplated.

In 1896 William H. Bennett described a method of attacking this problem by the use of an omental plug. He encountered a perforated gastric ulcer in which the area of induration was 3 inches in diameter and the perforation a half inch in diameter. He was unable to suture it so he pulled up the omentum and

after inserting a portion of it into the orifice, sutured it into position by a through and through stitch tacking the rest of the omentum about it. The patient recovered.

In 1927 Martin and Rogers using balloons studied the hunger contractions of the stomach. They demonstrated the phenomenon of circular constriction of the lower third of the stomach. They showed that this also took place in the antrum with a general shortening of the stomach separating periodically the fundus body and pars pylorica. This is quite similar to what takes place in the small intestine. Parkas Gruber showed that proximal dilatation and distal contraction take place in the body while proximal contraction and distal dilatation take place in the pars pylorica of the stomach.

Although it is well known that the stomach has 3 sets of muscle fibers that produce contractions there exists a small area on the lesser curvature of the prepyloric region at the level of the incisura angularis extending for 1 to 2 centimeters, which is almost without longitudinal fibers. This is the most frequent site of perforation for prepyloric ulcers. For this reason Forsell calls it the membrana angularis. The predominating muscular fiber development at the prepyloric and pyloric region is therefore the circular fibers (5). These produce contractions at right angles to the long axis of the stomach and duodenum. It appears logical to assume that in closing a perforation at this point by suture methods only sutures placed at right angles to the circular fibers will be effective and they must always include these fibers. However since this is dependent upon the presence of such holding fibers the extent of disease when very great precludes the use of this tissue in suturing. A graft closure therefore which does not require the use of sutures should succeed more frequently than

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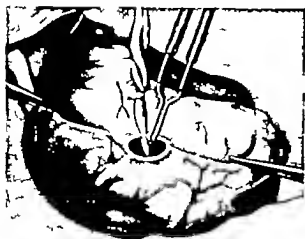


Fig. 1. First stage of experiment. Artificial perforation with cautery.

any type of suture closure. It appears logical to assume that from the mechanical view point, a successful graft closure using an adhesive method instead of sutures would operate independently of the anatomical distribution of the muscular layers of the stomach.

Sano in 1943 used a sutureless technique to hold skin grafts in place. His method utilized dried plasma and leucocyte cream. His grafts were completely fixed in 4 days.

Cannaday in 1943 employed strips of skin in repairing hernial defects and no ill effects came from hurrying skin in soft tissues. He also used a thromboplastic method.

Young and Favata, in 1944 used thrombin solution on unwashed skin graft and normal pooled plasma on the recipient area.

In 1946 John Devine, an Australian described the use of peritoneal grafts as a seal to prevent leakage after intestinal anastomosis by suture.

Price and Lee in their observations of gastric digestion on living tissue found that there is a great variation in the susceptibility of living tissues to gastric digestion. In the order of their susceptibility they found first the seromuscular coats of the intestine and gall bladder omentum cartilage, kidney spleen lung liver and pancreas. The most resistant of all are fibrous connective tissue skin and gastrointestinal mucosa.

The present experiment utilized as the graft of choice, a combination of peritoneum and



Fig. 2. Second stage of experiment. Perforation plugged with cycol and covered with peritoneal fascial graft. Schematic representation of cross section.

fascia, as found in the posterior rectus sheath, to either side of the midline. The grafts used were taken at that point where the posterior rectus sheath and peritoneum are fused almost inseparably.

EXPERIMENTAL METHOD

In order to simulate the induration of a perforated ulcer in the experimental animals, the perforations were produced with cautery the heat producing a white coagulated area about the perforation and searing the edges of the perforation.

Nine dogs were used in the experiment. It was felt that if a graft held under clean experimental conditions without the presence of infection then further attempts should be made in the presence of active disease.

The size of the perforation was given considerable thought. If too small, then our purpose would be defeated as it might then close by itself. If too large, then an autogenous graft of peritoneum of adequate size could not be taken from the animal safely. It was decided to produce with cautery a perforation 0.625 centimeter in diameter through the stomach wall in the prepyloric or in the duodenal area and cook the surrounding tissue so that the perforation would remain open.

All animals were opened through an upper midline incision about 5 centimeters long. The anesthesia for all animals was intraperitoneal nembutal the amount varying from 2 to 4 cubic centimeters of a solution of nembutal consisting of 1 grain per cubic centimeter of a 10 per cent alcoholic solution. The amount given was on the basis of 1 cubic centimeter per 5 pounds of weight in each animal. Comparatively small animals were used.

Experimental dog was perforated on the anterior wall of the stomach in the prepyloric area. The



Fig. 3. Drawing showing the external appearance of the fascial-peritoneal graft in place after application of the plasma clot and pressure.



Fig. 4. Healed appearance of the serosal surface of the stomach 1 month after healing by plasma clot graft, over perforation. This healed area can be seen in Figure 5 after section and microscopic study.

patch of fascia peritoneum 2.5 centimeters long and 1.25 centimeters wide was taken from behind the left rectus muscle. The serosa of the stomach wall was moistened with a few drops of human plasma, while the graft was moistened on the peritoneal surface with bovine topical thrombin solution, 1:5000. The graft was then spread out over the perforation and allowed to remain there for 3 minutes. The abdomen was then closed in layers cotton suture material being used throughout. This animal died 24 hours postoperatively. Postmortem examination revealed no free fluid in the peritoneal cavity and no visible exudate. The graft still remained in place over the perforation but one small edge was loosely adherent at one point and may have leaked sufficiently to cause death, apparently from peritonitis.

Experimental dog 2 was operated on under the same conditions. This time the graft was applied after the gastric serosa was moistened with human plasma. A hypodermic needle was then inserted beneath the graft and the topical thrombin was injected under it in a fanwise manner. This graft was 1.25 by 1.25 centimeters in diameter. The animal appeared alive and well for 5 days and was sacrificed to determine the extent of healing. It was discovered that the graft had slipped 2.5 centimeters from the original site of perforation but that the perforation had become covered by the liver sufficiently enough to prevent for the time being a spill and subsequent peritonitis. The fascial peritoneal graft however had become adherent to the serosal surface of the stomach 2.5 centimeters away.

Experimental dog 3 was operated on in the same way. A graft 1.5 by 1.87 centimeters was placed over the perforation. Plasma and topical thrombin were again used as an adhesive agent. This animal died 24 hours postoperative of a fulminating peritonitis. Postmortem revealed the fact that the graft had

completely slid off the stomach wall and lay free in the peritoneal cavity permitting the gastric contents to pour through the perforation quite freely. The graft was found to have a pale appearance as though it had undergone a bleaching process, perhaps from the digestive action of the gastric juices. The peritoneal cavity was filled with a purulent flaky fluid the intestines were matted together with a plastic like exudate and distended. The perforation was wide open. Nature had not been able to cover this opening with any of the neighboring organs such as omentum, liver, or contiguous intestinal loops.

Experimental dog 4 was subjected to the same procedure except that for the first time, the idea of packing the perforation was introduced. This was done with the use of oxidized cellulose gauze. The excess after filling the perforation, was then cut off flush with the gastric serosa, and the human plasma placed on and around the plug. The graft was then placed over the perforation and topical thrombin was squirted beneath it with a syringe. The animal died on the eighth postoperative day. Another variation was attempted at the time of operation upon this animal in that the usual fascial peritoneal graft was not taken. In this case, a strip of the falciform ligament of the liver was removed which was quite thick. It appeared quite vascular and more dense than omentum but was very fatty in appearance and structure. Postmortem findings showed death due to peritonitis. The perforation had leaked past some of the plug. Most of the latter however had remained undisturbed in the perforation but had turned a soft mushy green with gastric juice oozing out from along side of it, at one point. However there was no sign of the fatty patch from the falciform ligament. It may have been completely digested but because of the purulent exudate filling the peritoneal cavity this could not be determined objectively.



Fig 5 Microscopic section through healing graft 1 month postoperative. The arrow indicates the junction of

the graft with the original serous surface of the stomach. X85.

Experimental dog 5 was operated upon similarly but a fascial peritoneal graft was used over the perforation. Again a plug of oxycel gauze was used in the manner described above. However the fascial peritoneal graft was held in place by a clamp during the procedure for a period of 3 to 5 minutes with the hope that the pressure under direct vision would enhance the adhesive process assuring complete sealing of the graft. This animal was reoperated upon 33 days later and will be described later on when the type and degree of healing over the perforation will be revealed.

Experimental dog 6 was subjected to the same operative technique as dog 5 except that a pressure clamp was used which did not permit complete direct vision of the graft while it was held in place. This clamp failed to hold down the edges of the graft allowing the perimeter to curl up permitting a leak to develop at one edge, thus causing death from peritonitis on the sixth postoperative day.

Experimental dogs 7, 8, 9 all lived for a month or more after the operation described above on experimental dog 5. The graft used in each of these cases was fascia-peritoneum from the posterior rectus sheath aponeurosis, and peritoneum. In addition to the oxycel plug used, the same type pressure clamp was again used, in the same manner. This clamp offered obvious advantages over the opaque metal clamp used on dog 6.

Thus we had 4 dogs surviving 1 month or more after closure of a perforation of the stomach by application of a graft without the use of any type of suturing. It will be noted that the animals that survived all received the same treatment in the application of the graft over the perforation. All had a plug of oxycel gauze placed into the perforation. The graft was applied and held in place by a pressure clamp that permitted direct vision of the entire patch of tissue used in the graft. Dog 5 lived

32 days, dog 7 33 days, 8 36 days and 9 35 days. All these latter animals were either sacrificed or subjected to a partial gastrectomy in order to obtain the gastric specimen for microscopic study of the healing produced.

In sacrificing these animals the factor determining survival time was the selection of a period during which complete healing seemed assured.

The type of healing is seen in the photomicrographs presented. The gross and microscopic features were the same in all animals. Sections of tissue were taken from dogs 5, 7, 8, and 9 after about 1 month or more of healing, some 32, 33, 36 and 35 days respectively after grafting. All slides showed that dense, strong fibrous healing had occurred. In all sections the mucosa had regenerated and spread across the artificially created perforation. Strong fibrous union developed across the serosal and muscular layers, with an increase in thickness of the stomach wall at that point.

In those animals that did not receive pressure to their graft initially all developed some type of leakage or slipping of the graft. Those that had no oxycel plug died in 24 hours, although one animal died after 5 days, living that long only because the liver had covered the perforation accidentally. The oxycel plug allowed dogs 4 and 6 to live 8 and 6 days respectively but if the graft had held, leakage would not have taken place. The purpose of the plug is twofold. It acts as a bulwark against the intra-gastric pressure which tends to blow the graft

off and secondly being of cellulose, it is even more difficult to digest than is fascia. The combination of this cellulose plug and a fascial peritoneal graft appears to hold strong promise in sealing off gastric perforations.

PREFERRED METHOD OF CLOSURE DEVELOPED

1. The perforation should be plugged with oxycel moistened with 1 per cent sodium bicarbonate solution.

2. Pooled human plasma, 1 to 3 cubic centimeters is applied to the serosal surface of the stomach and plug filled perforation.

3. The graft cut from the posterior rectus sheath of the anterior abdominal wall includes peritoneum as well as fascia and aponeurosis. The graft must be large enough to cover the perforation without being placed on stretch and should cover the perforation overlapping the edges far enough to provide adequate surface contact between graft and gastric serosa so as to provide a good adhesive surface. The graft should be moistened with 1 to 2 cubic centimeters of bovine topical thrombin 1:5000 and this moistened side applied to the plasma moistened serosal area on and around the perforation.

4. The surface to be applied to gastric serosa should be the fascial side of the graft.

5. The graft is held in place by the clamp described in the article. This clamp has a flat surface which holds the graft in place spread out flat. This flat surface is transparent and of plastic material fastened to a metal ring clamp by small countersunk rivets. It can take sterilization by pressure boiling without any loss of visibility or wrinkling of surfaces. By its use, it is felt that the edges of the graft are prevented from curling. Curling of the edges may result in an incompletely sealed patch which may work itself loose, just as a blowout patch on an automobile tire. It is held in place by clamp for 5 minutes.

ANALYSIS OF STUDY

The size of the graft is very important. It must cover the perforation and beyond as far beyond at least as the diameter of the perforation, more if feasible. The larger the graft the less likely leakage will take place. It is our impression that autodigestion of the oxycel

TABLE I—SUMMARY OF RESULTS—9 EXPERIMENTAL ANIMALS

	Technique	Result	Cause
Dog	Peritoneal graft, no plug, no pressure	Died—24 hrs.	F. Peritonitis—leak age
Dog	Peritoneal graft, no plug, no pressure	Sacrificed after 5 days	Perforation covered by liver. Graft slipped
Dog 1	Peritoneal graft, no plug, no pressure	Died—4 hrs.	P. It. It. — Leakage
Dog 4	Falldorm ligament graft, oxycel plug used, no pressure	Died 8 days post operati	Graft slid off or was digested. Pl. It. led Peritonitis present
Dog 5	Peritoneal graft, oxycel plug used, pressure applied	Alive after 3 days	Rectected for specimen. Slide 7377
Dog 6	Peritoneal graft, oxycel plug, pressure applied	Died 6 days post operati	Peritonitis—leak age under edge 1 case point
Dog 7	Peritoneal graft, oxycel plug, pressure applied	Alive after 33 days	Rectected for specimen Slide 738
Dog 8	Peritoneal graft, oxycel plug, pressure applied	Alive after 36 days	Rectected for specimen Slide 739
Dog 9	Peritoneal graft, oxycel plug, pressure applied	Alive after 35 days	Rectected for specimen Slide 740

plug or the peritoneal fascial graft is the least likely cause for failure. The mechanical failure at the time of sealing is the important factor. Meticulous care during the period of grafting will prevent leakage. The cellulose plug and the peritoneal fascial graft have been shown to be markedly resistant to the autodigestion of gastric juice.

The graft must be held in place for a sufficient time 3 to 5 minutes to allow the adhesive action of the plasma and topical thrombin to take place. The type of pressure clamp used must preferably have a flat surface and it should permit direct vision of the graft at all times during the procedure in order to prevent the eversion or inversion of the edges of the graft. This is the reason for a plastic glass simulated faced clamp as devised by the author. It is also possible to make this clamp in varying sizes to facilitate its use with any size graft desired.

In all the animals the operative wounds healed by primary intention except in dogs 2 and 9. The former was reoperated upon after the fifth day when it was found that the graft had slipped and had become adherent to the gastric serosa 2.5 centimeters from the original graft site. The perforation had temporarily been covered by the liver preventing death.

from peritonitis. This animal had a local wound infection and if permitted to live would have eventually died of peritonitis and wound disruption.

The oxycel plug in addition prevented the graft from blowing off as the result of the production of intragastric pressure from the muscular contractions of the stomach wall and the swallowed air which distended the stomach during contractions. This was seen during the operation when the graft was dropped loosely over the perforation prior to using a plug. It was observed that the graft would balloon up during these contractions over the site of perforation. The plug therefore prevented such displacement of the graft. The segmental contractions that oppose each other at the membrana angularis is another mechanical factor that must be given consideration. It is believed that these opposing contractions may be responsible in some measure, for the cutting through of sutures when attempts are made to close perforations through indurations of the prepyloric or duodenal ulcers.

Experimental dog 9 about the 10th day postoperative, developed an incisional hernia which receded without postoperative intervention and on reoperation 35 days later was found to be only a defect in the abdominal wall itself. The graft had healed completely and was in no way associated with the wound of the abdominal wall. The incisional hernia was in most probability due to poor suture technique in closing the abdomen.

It is with the hope that others may carry on further experimental work along similar lines that this paper is offered. It may possibly develop into a newer and more physiological approach to perforations which are unsuitable for suture closure.

SUMMARY

1. A new experimental method of nonsuture closure of gastric perforations is offered.
2. Nine dogs were used in the experiment. Four survivals of more than 30 days were obtained from the application of an artificial plug and fascial peritoneal graft applied by plasma clot technique.
3. The failures in the experiment are explained on the basis of mechanical defects in the technique of applying the graft.
4. It is hoped that further experimental efforts will be made to develop this technique and apply it to human beings.

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ONE STAGE PANCREATODUODENECTOMY

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PANCREATODUODENECTOMY has become a recognized procedure for the excision of carcinomas of the ampulla of Vater, head of the pancreas, terminal portion of common bile duct, and neoplasms of the duodenum exclusive of the ampulla but invading the head of the pancreas. Whereas there is agreement on the general principles of the operation, there is still discussion concerning details as to the type of gastrojejunostomy to be performed and the question and manner of reimplantation of the neck of the pancreas into the jejunum. It is generally agreed that choledochojejunostomy with or without cholecystjejunostomy is preferable to cholecystgastrostomy or cholecystjejunostomy because the ligated common duct may open with escape of bile and bile peritonitis.

The incidence of pancreatoduodenectomy is still somewhat limited and for this reason the reporting of relatively small series of such operations with their immediate results is in order. In a previous report (1) in 1943 the author summarized an experience based upon 8 operations; the mortality was 50 per cent. In Whipple's collected series (41 cases) up to April 1941 the operative mortality was 27 per cent. In Orr's collected series from April 1942 to November 1944 (35 cases) it was 26 per cent. This report includes 7 personal unselected and consecutive patients operated upon in which sufficient time has elapsed to permit of the evaluation of immediate results.

CASE REPORTS

CASE 1 N.C. (311069) white male 42 years of age. On October 6, 1943 a partial gastrectomy was performed for what was thought to be a peptic ulcer penetrating into the head of the pancreas. Histologic examination revealed the lesion to be a carcinoma, and sections showed that neoplasm had been left behind on the head of the pancreas. On November 20, 1943 the patient was subjected to one stage pancreatoduodenectomy for excision of

residual carcinoma in the head. There appeared to be no metastases at this time.

A few weeks following discharge from the hospital the patient's general condition began to deteriorate and he died at home March 21, 1944. Necropsy was not obtained.

CASE 2 E.R. (305306) female aged 42 years was admitted to the hospital November 17, 1944, complaining of icterus and pruritus of 6 months duration, upper abdominal pain for 2 days. There had been a loss of 36 pounds in weight during the previous several months.

On November 22, 1944 a one stage pancreatoduodenectomy was performed for a small carcinoma just within the ampulla of Vater. Study of microscopic sections revealed beginning infiltration into the head of the pancreas. There were no lymph node metastases.

Convalescence was uneventful. Since then the patient's condition has been satisfactory and her existence has been normal as to general health and activity. There are two to three bulky light colored stools a day; the appetite is very good. No evidence of recurrences 3 years and 1 month following operation.

CASE 3 C.P. (349868) white male aged 49 years. The patient was admitted to the hospital on January 1, 1945, complaining of a sensation of fullness after meals of 2 weeks' duration and loss of 20 pounds in weight during the previous 3 months. Roentgenographic examination revealed a lesion of the pylorus.

On January 29, 1945 a laparotomy was performed at which time a carcinoma of the pylorus was found infiltrating rather deeply into the head of the pancreas. A one stage pancreatoduodenectomy with cholecystocholedochojejunostomy was performed with implantation of the transected neck of the pancreas into the loop of jejunum brought up for the above anastomosis. Study of the specimen revealed metastases in several nodes.

Convalescence was uneventful and there was healing without fistula.

His condition was satisfactory for 1 year during which time he continued to work. On the occasion of a visit to the out-patient clinic a year after the operation a spherical mass 3 centimeters in diameter was excised from within the lumbar muscles. Histologic examination showed this to be metastatic carcinoma.

In October of 1946 he was readmitted to the hospital because of severe upper abdominal pain (no weight loss) and a deep palpable epigastric mass. A second laparotomy was performed at which time a large mass of recurrent carcinoma in the transverse mesocolon infiltrating the transverse colon and loop of jejunum was excised. He died of shock 3 hours after

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Fig. 1. Photograph of surgical specimen obtained from pancreatoduodenectomy in Case 5. T, Carcinoma; P, head of pancreas (bisected); S, lower stomach; Ch, cholecyst gastrostomy tube (this operation had been performed previously in another institution); L, chain of enlarged lymph nodes from porta hepatis resected along with specimen; Ch, transected and opened lower common duct.

completion of the operation. Necropsy was not obtained.

CASE 4. C.T. (351103) white male aged 7 years was admitted to the hospital February 2, 1945, complaining of 25 pounds weight loss during the previous year, constipation for 4 months and postprandial pains for several months. Roentgenograms revealed an irregular constricting lesion in the third portion of the duodenum with ulceration.

On March 2, 1945, a one stage pancreatoduodenectomy was performed with choledochocholecystojejunostomy and implantation of the transected neck of the pancreas into the loop of jejunum. Pathologic specimen revealed an ulcerating adenocarcinoma of the jejunum infiltrating the head of the pancreas. Regional lymph nodes contained two metastases.

Convalescence was fairly satisfactory. He was discharged from the hospital, but his condition deteriorated at home and he died June 3, 1945, 3 months and 1 week after the operation. Necropsy performed elsewhere revealed carcinomatosis.



Fig. 2. Photograph of surgical specimen removed in Case 7 shows S, lower stomach; entire duodenum and first few centimeters of jejunum; P, head of pancreas; T, transected neck of pancreas; D, carcinoma primary in second segment of duodenum but not associated with the papilla of Vater; L, large metastatic lymph nodes from about head of pancreas and 1, root of transverse mesocolon.

CASE 5. J.M. (378275) white male aged 54 years. In December 1945 the patient exhibited painless jaundice and received an exploratory laparotomy in another city and cholecystgastrostomy was performed. He was admitted to the University of Chicago Clinics March 18, 1946 showing no icterus and in good general condition.

On March 31, 1946, a pancreatoduodenectomy was performed. The cholecystgastrostomy was taken down and the biliary tract drained by choledochocholecystojejunostomy. Study of the specimen (Fig. 1) revealed the carcinoma in the head of the pancreas to be 7 by 5 by 6 centimeters. The resected lymph nodes contained no metastases. Convalescence was uneventful. His condition remained satisfactory until the early fall of 1946 when he began to lose weight and developed palpable masses in the upper abdomen. He died at home in the early part of December, 1946; necropsy was not obtained.

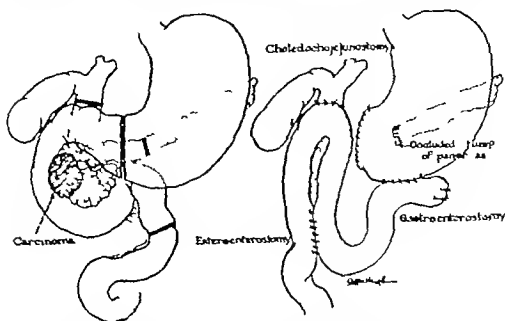


Fig. 3. Diagram of one stage pancreatoduodenectomy without implantation of the transected pancreas into jejunum (*Su & Gyn Obs* 1943, 77: 581)

CASE 6 R.L. (376886) white female aged 49 years. In October 1945, at another institution cholecystectomy was performed for what was interpreted as cholecystitis. 5 weeks later icterus and upper abdominal pain recurred and a second laparotomy was performed at which time a carcinoma of the head of the pancreas was discovered and the abdomen was closed. She was admitted to the University of Chicago Clinics February 27 1946 with mild icterus.

On March 2 1946 a one stage pancreatoduodenectomy was performed. Study of the surgical specimen revealed a small carcinoma in the head of the pancreas just beneath the ampulla of Vater. There was metastasis in one of the two lymph nodes examined.

Convalescence was uneventful, a pancreatic fistula persisted for 6 months and then closed spontaneously.

During the spring, summer and fall of 1946 her condition was satisfactory, appetite was good, there was no gain in weight and there were 2 to 4 bulky light colored stools a day.

In January 1947 two hard rounded masses developed in the abdominal wall beneath the laparotomy scar—obviously recurrences. These were excised and the patient remains well 5 months later.

CASE 7 C.F. white male aged 38 years was admitted complaining of upper abdominal pain, distention, vomiting and 30 pounds loss in weight during previous 6 months.

Röntgenograms revealed a markedly constricting and obstructing lesion in the midportion of the second segment of the duodenum with dilatation of the duodenum above and the stomach.

One stage pancreatoduodenectomy on September 14 1946. The constricting lesion in the second segment of duodenum was obviously a neoplasm. There were markedly enlarged lymph nodes about the head

of the pancreas and in the periaortic region (Fig. 2). The latter were resected separately as a group. Histologic study revealed the primary growth to be a carcinoma. The enlarged nodes showed very pronounced lymphoid hyperplasia with small strands and clumps of metastatic carcinoma cells. Convalescence was uneventful.

June 15 1947 9 months after operation the patient is well, ambulatory and gaining weight. There is a pinpoint pancreatic fistula in the laparotomy scar. He has 2 to 3 light colored bulky stools a day. No special medication. Appetite and strength satisfactory.

RECAPITULATION OF RESULTS

Patient	Pancreatoduodenectomy performed for	Result
Case 1	Carcinoma of pylorus infiltrating head of pancreas	Lived 4 mos. Died of carcinomatosis. No palliation.
Case 2	Carcinoma ampulla of Vater	Living and 11 yrs 6 mos.
Case 3	Carcinoma of pylorus infiltrating head of pancreas	Lived yr 9 mos. Received palliation died with recurrences.
Case 4	Carcinoma of third portion of duodenum infiltrating head of pancreas	Lived little over 3 months—died of recurrences.
Case 5	Carcinoma of head of pancreas	Lived 8 months; died of carcinomatosis; received palliation.
Case 6	Carcinoma of head of pancreas	Living and 6 yr and 3 mos. after operation.
Case 7	Carcinoma of second segment of duodenum, not involving papilla of Vater	Living and well 9 months.

It may be pointed out that of the 7 patients receiving pancreatoduodenectomy in only 3 instances was the procedure carried out for

primary growths of the ampulla or head of the pancreas. In 2 instances the operation was for carcinoma of the most distal portion of the pylorus with invasion of the head of the pancreas and in 2 instances for primary carcinoma in the second and third portions of duodenum respectively not involving the ampulla but invading the head of the pancreas.

The writer up to the present, and with exception of Cases 3 and 4 has followed the technique previously described and illustrated again in Figure 3. There is always a pancreatic fistula that persists for several months following this type of procedure. Reimplantation of the transected neck of the pancreas into jejunum would seem to obviate this drainage and hence would appear to be justifiable on this basis alone not to mention the possibility of returning the pancreatic secretions to the bowel.

For a period following its introduction pancreatoduodenectomy was regarded as a formidable procedure which entails a high mortality. At present the mortality has become appreciably reduced. Of course, this is the usual course of events as illustrated by the histories of partial and total gastrectomy combined abdominoperineal resection etc.

The advances in supportive treatment have permitted such extensions of operative sur-

gery. In regard to cancer necessitating pancreatoduodenectomy the incidence of very prolonged survival will be dependent upon earlier diagnosis of lesions necessitating this operation for this reason awareness of these lesions on the part of physicians will influence the ultimate surgical results.

SUMMARY

Pancreatoduodenectomy has become a recognized procedure to deal with cancer necessitating excision of the lower stomach, the entire duodenum, and the head of the pancreas *en masse*.

A personal series of 7 unselected consecutive pancreatoduodenectomies is reported without surgical mortality.

The relative safety of the operation renders earlier diagnosis of lesions in the ampulla and head of the pancreas all the more imperative in order to achieve an increasing incidence of prolonged survivals.

Addendum.—Since the above report was written, additional pancreatoduodenectomies (one stage) have been performed with surgical mortality. This affords an operative mortality of per cent in a small series of 1 cases. The latter are consecutive and unselected.

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ACUTE INJURIES INVOLVING THE LARGE BLOOD VESSELS IN THE NECK

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INJURIES to the large vessels in the neck occur infrequently. The small size of the neck with respect to its exposed surface and the possibility of decreasing this exposed surface by lowering the chin and raising the shoulders makes the prospect of frequent injuries to this part of the body unlikely. Some of those who sustain injuries to the neck involving large vessels succumb immediately from exsanguination strangulation or aspiration of blood into the pulmonary tree. Others die shortly after injury from cerebral changes due to the progress of a thrombus or embolus while still others die from concomitant injuries in the neck.

In addition to the common external and internal carotid arteries there are present in the neck branches of the subclavian artery notably the vertebral artery and the thyrocervical axis with its several branches. Control of bleeding in the neck makes it necessary to have exposed or available in the field access to both the common carotid and subclavian if loss of blood and tissue damage is to be kept at a minimum. Venous bleeding from the internal jugular or subclavian veins may be more difficult to control than arterial bleeding but methods are available to reduce to a minimum blood loss and additional trauma.

This report concerns 6 patients who sustained injuries to the common carotid artery alone or in conjunction with other vascular injuries in the neck and 3 patients who sustained other significant vascular injuries to the neck. The methods employed in the initial management of the cases recorded here are described in the case reports.

CASE 1: Lt W. aged 28 years was wounded by a sniper's bullet at 12 noon January 5, 1944 and was admitted to the hospital 6 hours later. He complained of difficulty in breathing and a rapidly en-

larging mass on the left side of his neck. On examination there was found an entrance wound below the left chin and an exit wound below the left mastoid. Pulsation of the left temporal artery was not present and machinery like sounds were heard on auscultation over the tense mass on the left side of the neck. At 9:00 p.m. under nitrous oxide-oxygen-ether anesthesia administered through an endotracheal tube the left common carotid artery was exposed through an incision along the anterior border of the sternomastoid muscle below the level of the wounds. A tape was passed beneath the artery for provisional control of the flow of blood. The vessels above the level of the wound were similarly exposed and provisional control of the artery and vein was done. There was a free flow of blood between the carotid artery at its bifurcation and the internal jugular vein. There was an extensive hematoma which had dissected downward to the mediastinum and infiltrated the adjacent fascial spaces. The carotid artery at its bifurcation was lacerated for a distance of 1.5 centimeters. The rent extended obliquely from the common carotid below the internal carotid into the external carotid distal to the origin of the superior thyroid artery. The internal jugular vein had two large irregular perforations with loss of substance (Fig. 1).

The opening in the artery was closed with a fine silk suture. The vein was ligated proximally and distally and the intervening portion was removed leaving neither damaged vessel wall nor a distended vessel segment in the wound. Pulsations were noted in the external, internal, and common carotid arteries at the close of the operation. The skin wound was not sutured but the head was turned to the left allowing closure of the incision.

The postoperative course was uneventful. The patient was evacuated to the base hospital on January 18, 1944 with the wound almost healed. There were no mental or physical disabilities. After study of his condition with special reference to mental or central nervous system changes over a period of several weeks he was discharged to full duty as an infantry officer.

The location of the injury in the artery was such that the control of bleeding by ligature would have required ligations of the common external and internal carotid arteries and the superior thyroid artery. That suture of large rents is possible is demonstrated by this case. Anticoagulants were not used but it is likely

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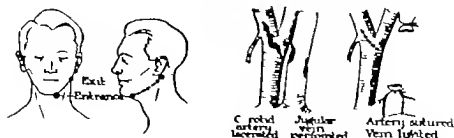


Fig. Case 1

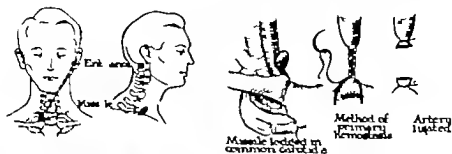


Fig. 2a.



Fig. 2b

Fig. 2a. Drawing showing wounds and treatment in Case 2. b. Roentgenogram showing foreign body on right side. Point of entrance as on left side. Tracheotomy tube is in place. Injury to common carotid artery.

that their use is desirable to preclude the possibility of thrombosis in large vessels. Decompression of the fascial spaces of the neck with evacuation of the hematoma is desirable because of the danger of infection in a contaminated wound containing stagnant blood. There was no clinical evidence of infection in the wound at anytime and in the light of subsequent experience provisional closure of the wound may be desirable. However it is remarkable that positioning the head properly

permits closure of the wound without suture and healing takes place with a fine scar.

CASE 2. Pvt. S. aged 20 years, sustained a bullet wound of face, jaw and neck at 9:35 a.m. January 7, 1944 and was admitted to the hospital at 2:15 p.m. of the same day. He was cyanotic and dyspneic from tracheal obstruction and tracheotomy was done at 2:30 p.m. A bullet penetrated over the left malar bone causing a compound comminuted fracture of the left mandible, compound fracture of the hyoid bone and laceration of the trachea. The bullet lodged in the right supraclavicular fossa 1 front of the 7th

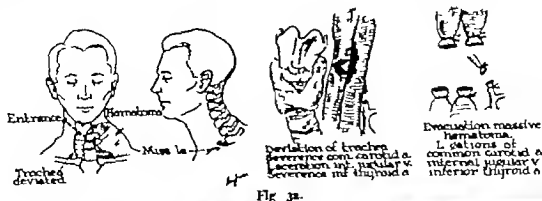


Fig. 3a.

Fig. 3. a. Drawing showing wounds and treatment in Case 3 b. Note displacement of trachea to side opposite to location of vascular lesion. Injury to common carotid artery, internal jugular vein, and inferior thyroid artery.



Fig. 3b.

transverse cervical process. At 12 30 a. m. January 8 1944 under ether anesthesia administered through the tracheotomy tube, the wound over the left malar bone was debrided. The deep structures on the right side of the neck were exposed and it was found that the bullet had penetrated the lumen of the right common carotid artery. Removal of the bullet was followed by a free flow of blood. Control of bleeding was effected by the use of a 'stick sponge' placed behind the clavicle to compress the proximal portion of the carotid artery. The defect in the artery was extensive. To control bleeding the wound in the artery was closed by suture starting distally and proceeding proximally until the lumen was occluded. The damaged segment was excised after proximal and distal ligations.

The jaws were wired on January 9 and the tracheotomy tube was removed on January 14. The patient was evacuated to the base hospital on January 18. There were no mental or physical changes related to ligation of the carotid artery. When seen 4 weeks later he was making satisfactory progress awaiting healing of the fractured mandible.

The location of the bullet low in the neck with active bleeding upon its removal suggested several more extensive procedures for

control of hemorrhage at this level. The method used—obliterative closure of the lumen of the vessel at the level of the damaged segment by the placement of a continuous suture starting distally and proceeding proximally until all bleeding was controlled made possible proximal and distal ligations in a dry wound. Cutting the clavicle resection of the clavicle in part or dislocation of the sternoclavicular joint for a more liberal exposure of this part of the vessel may be necessary in similar instances. However the method made use of in this case was adequate for the purpose.

CASE 3. Pvt. N. aged 18 years sustained a shell fragment wound of the neck at 6 30 p. m. January 11 1944. He complained of difficulty in swallowing was dyspneic and had considerable swelling of the neck. There was a small wound of entrance on the right side at the level of the cricoid cartilage. All structures in the pharynx were hemorrhagic and edematous. An x-ray study showed considerable deviation of the trachea to the right with a foreign body lodged



Fig. 4a.



Fig. 4b.

Fig. 4. a, Wounds and treatment in Case 4. b, Not displacement of trachea. Injury to common carotid artery.

in the left supraclavicular fossa. At 6:00 a.m. January 12 under nitrous oxide-oxygen-ether anesthesia administered through an endotracheal tube (after preliminary cannulization of the pharynx and larynx), an incision was made along the anterior border of the left sternomastoid muscle. The common carotid artery was provisionally controlled proximal to the site of the injury. An arteriovenous communication was present. A large accumulation of blood was evacuated from the adjacent spaces. In spite of control of the common carotid artery and internal jugular vein a brisk flow of blood filled the wound. Pressure over the subclavian controlled this bleeding. It was found that the source of this bleeding was the completely severed inferior thyroid artery. The proximal and distal ends of this vessel were ligated. The common carotid artery was ligated proximal and distal to the injured zone and the intervening segment was removed. The internal jugular vein was similarly excised following high and low ligations. The neck wound was not sutured but closed by turning the head to the left. Recovery was uneventful and on January 21, 1944 he was vacated to the base hospital. There were no mental changes and no central or peripheral nervous system alterations were noted. On February 1, 1944 complete closure of the neck

wound was done under nitrous-oxide-oxygen anesthesia. Postoperatively he had a right hemiplegia. During the following 4 weeks he made a gradual recovery and when last seen at that time was up and about but wrist drop was still present.

Operations under anesthesia which may be associated with anoxemia should not be undertaken for some time after a carotid ligation. A period of 6 weeks to 2 months would not be too long a period. The Matas test is desirable in determining the competency of cerebral circulation.

Secondary closures of neck wounds may be avoided by instituting primary closure or by permitting wound closure without suture by positioning of the head and proper bandaging. Case 1 related previously had no secondary closure for a similar wound but the scar was finer and smoother than that in Case 3.

It may appear ambiguous to caution against anesthesia which may result in anoxia when

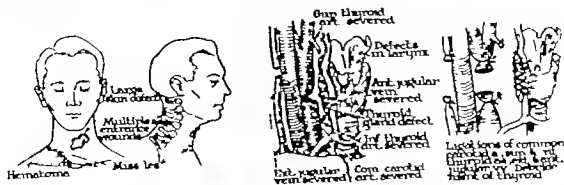


Fig. 5a.

Fig. 5. a. Wounds and treatment in Case 5 b. Zipper fragments within wound. Injury to common carotid, superior and inferior thyroid arteries, external and anterior jugular vein, thyroid gland, perforation of the cricoid.



Fig. 5b.

the immediate operation was done under nitrous oxide-oxygen-ether anesthesia. It must be emphasized that in these patients a special effort is made to avoid anoxia and an adequate amount of oxygen is administered from the very beginning.

It is also possible that an embolus liberated from a thrombus at the site of ligation of the distal end of the common carotid artery was responsible for the hemiplegia although 3 weeks had elapsed since surgery was done. Whatever the reason may be this patient illustrates a hazard associated with damage to a carotid vessel. The need for the prevention of anoxia during anesthesia and for some time thereafter and a technique that will prevent thrombosis with its hazard of embolism are worthy of emphasis.

CASE 4. Pvt F. aged 19 years, sustained a shell fragment wound of the left side of the neck at 2:00

p.m. February 19, 1944, and was admitted to the hospital at 6:30 p.m. of the same day. He was dyspneic and had a pulsating swelling on the right side of the neck. The wound of entrance was small, located over the sternomastoid muscle at the level of the thyroid cartilage. An x-ray study showed deviation of the trachea to the left with the foreign body lodged in the right side of the neck (Fig. 4). Because of the development of extreme difficulty in breathing a rapid endotracheal intubation was done under light anesthesia. Following this nitrous oxide-oxygen-ether anesthesia was continued successfully and exploration of the right side of the neck was done. After provisional control of the common carotid artery proximal and distal to the site of injury a hematoma was evacuated and two irregular perforations of the arterial wall were noted. The extent of damage did not warrant suture of the defects since restoration of the lumen was not possible. The artery was ligated proximally and distally and the segment involved was excised. The wound was loosely closed. Recovery was uneventful and on March 10, 1944 the patient was evacuated to the base hospital. He showed no mental changes and there were no central or peripheral nervous system defects noted.

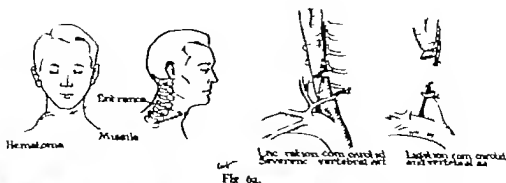


Fig. 6 a, Wounds and treatment in Case 6 b, Extreme displacement of trachea. Injury to common carotid and vertebral artery

There was no injury to the jugular vein in this case. No effort was made to isolate or ligate this structure. The matter of concomitant vein ligation when a large artery is severed as is frequently practiced in arterial wounds of the extremities needs further inquiry. In the immediate postoperative period for almost three weeks the patient showed no changes that would suggest a better result following vein ligation.

CASE 5. Lt R, aged 23 years, was injured at 11:00 a. m. February 28, 1944, when high explosive shell fragments penetrated his neck. He was taken to an advanced dressing station (Brit.) where it was found that he was pulseless, moribund, cyanotic, and cold. He was given immediately 1500 cubic centimeters of blood and $\frac{3}{4}$ grain morphine (?) intravenously. Through the open wound hemorrhage was controlled by ligatures and sutures. He responded well and at 1:30 p. m. his pulse was 80 and he appeared to be in good condition except for some bloody expectoration. He was evacuated and arrived at the hospital at 4:30 p. m. February 28, 1944. On admission his condition was satisfactory: temperature 38.6, pulse 80, respiration 20, blood pressure 120/82. There was a swelling on the right side of the neck and in the right

suprascapular fossa. In the center of the anterior surface of the neck there was a large defect in the skin measuring approximately 2 inches in diameter. Much blood oozed from the wound and no pulse was obtained in the right temporal artery. An x-ray study showed many small and one large metallic fragments in the soft tissues of the neck. At 6:30 p. m. under nitrous oxide-oxygen-ether anesthesia he was intubated with some difficulty because of considerable edema about the glottis. Wound excision was done. Zipper fragments, cloth and dirt were removed and a large portion of the right lobe of the thyroid gland was resected. The severed external and anterior jugular veins were ligated, the superior and inferior thyroid arteries were ligated, and the right common carotid artery was ligated proximal and distal to a large irregular opening in its wall. The right suprascapular fossa was exposed, a hematoma evacuated, and a small bleeding vessel was ligated.

During the operative procedure the blood pressure readings varied considerably. At one time the systolic pressure was 180, diastolic 110. Following surgery his blood pressure was 120/50, pulse 106, and respiration, 22. He was given 500 cubic centimeters of blood during the course of surgery. He did not awaken until 5:00 p. m. of the following day. During this period his pulse and respiration did not vary much but his blood pressure slowly rose to 140/60. At this time it was noted that there was a left-sided

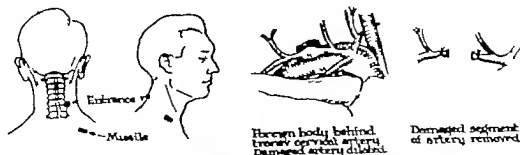


Fig. 7a.

Fig. 7. a Wounds and treatment in Case 7. b, Injury to transverse cervical artery



Fig. 7b.

hemiplegia. Vomiting occurred at noon February 29 and the patient showed marked drowsiness and difficulty in swallowing. At 4:00 p.m. he became comatose and showed marked spasm of both sides of the body. During the next 4 hours his blood pressure ranged between 185 and 210 systolic and between 0 and 90 diastolic. He never regained consciousness from this point on. A lumbar puncture gave a clear colorless fluid containing 2 white blood cells per cubic millimeter. The spinal pressure was 310 millimeters. Following the puncture there was a slight drop in the pulse and blood pressure but at midnight February 29 the pulse rose to 136, respiration, 24, blood pressure 152/90. He failed rapidly and expired at 1:00 a.m. March 1, 1944.

Autopsy (extract of report by Dr. Leo Kaplan)

There is found an extensive hemorrhage extending along all the fascial planes on the right side of the neck posteriorly to include the muscles of the posterior triangle of the neck superiorly to the base of the skull along the right sternomastoid and retropharyngeal space and inferiorly behind the esophagus into the entire posterior mediastinum to the diaphragm. There is no local accumulation of blood and there is no evidence of any recent bleeding. A small segment of the posterior aspect of the right lobe of the thyroid is found containing multiple sutures and separated from the isthmus of the thyroid by a defect. The superior and inferior thyroid arteries have been ligated. Two distinct sutures are found about the

right common carotid artery in the inferior aspect of the neck. There is a 6.0 centimeter defect between this point and that of the distal segment of the same artery where a silk ligature is found placed about the vessel. The vessel has retracted into the carotid sheath.

Within the proximal segment of the right common carotid artery is found a propagating thrombus which extends inferiorly for a distance of 4.5 centimeters. Within the distal end of this vessel is an other small nonadherent thrombus which measures 1.0 centimeter in length.

Dissection of the larynx shows a small perforation with margins that fall against each other. This wound passes through the substance of the cricoid cartilage in its right half and opens into the larynx. The thyroïd cartilage above this point is linearly fractured. The submucosal tissues about this fracture and perforation site are edematous and filled with organizing hemorrhages as far superiorly as the true vocal chord. The mucosa surrounding the puncture site is coated by a fibrinous membrane.

The dural alnuses are everywhere patent. The dura especially over the convexities is slightly adherent to the pia-arachnoid by very fine white fibrous strands which separate with slight difficulty. There is no evidence of any subarachnoid bleeding. Both cerebral hemispheres are swollen and exhibit gyral flattening but the left hemisphere is distinctly larger than the right. Dissection of the great vessels

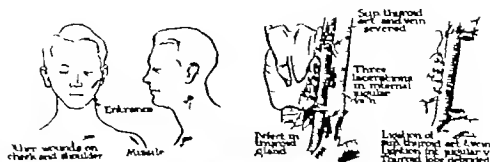


Fig. 7a



Fig. 8b

Fig. 8. Wounds and treatment in Case 8. b. Large foreign body with slight tracheal displacement. Injury to superior thyroid artery, vein, extensive injury to internal jugular vein

of the brain shows an intact circle of Willis, internal carotid artery basilar and vertebral arteries. A dissection of the right middle cerebral artery reveals a complete thrombosis beginning at a point 3.0 centimeters from its point of entrance to the Sylvian fissure. From here on the branches of the middle cerebral exhibit a staghorn type of thrombosis. There is an extensive softening of the right cerebral hemisphere most marked in its midportion and especially in the region of the basal ganglia. The right lateral ventricle is somewhat narrowed as compared with the left. The left cerebral hemisphere is edematous and slightly hyperemic. Serial section of the midbrain, pons and medulla show the former two to be the seat of extensive discrete and focal hemorrhages and areas of softening which are most prominent on the left side and in the periaqueductal region. The left superior cerebellar artery in some of its smaller branches which extend into the brachium pontis are thrombosed and encased in a small fusiform hematoma (etiology?). The medulla and the cerebellar hemispheres are edematous.

This patient sustained a severe injury to the neck involving many small vessels in addition to the right common carotid artery. Embol-

ism and thrombosis played a rôle in the changes which were fatal. The alterations in blood pressure and cerebral edema developing during surgery may indicate that manipulation soon after the first and second efforts in controlling hemorrhage may have been a factor in liberating emboli. The case study emphasizes the importance of the development of thrombi in traumatized vessels more especially when the blood flow through the vessel is impaired by a prolonged drop in blood pressure. The blood pressure phenomenon which developed at the time of surgery would indicate that cerebral changes of a serious nature had already occurred.

In the immediate care at the casualty station the value of a large amount of blood administered to replace a blood loss is illustrated. An important point for discussion concerns the advisability of occluding the wound until complete initial surgery can be undertaken.

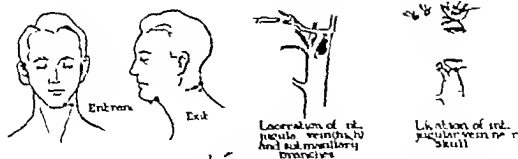


Fig. 9. Wound and treatment in Case 9

The grasping of bleeding vessels in a dirty wound with the placing of ligature and sutures may be a predisposing factor to thrombosis and early embolism. A desperate situation frequently requires what appear to be desperate means to preserve life. Since such desperate action may in itself preclude ultimate recovery it would appear desirable to consider all of the possibilities to control bleeding until the patient can be transported to a hospital where necessary initial surgery may be undertaken. Packing as a temporary measure may be more desirable than sutures and ligatures in a contaminated field.

CASE 6. B. M. aged 10 years, found a fountain pen booby trap near Anzio. On manipulation it exploded and a metal fragment penetrated the right side of his neck. He was taken to an aid station at 6:30 p. m. June 7, 1944 and evacuated to the hospital at 8:00 p. m. He was dyspneic, had a small wound in the midline at the level of the cricoid cartilage and a swelling on the right side of the neck. An x-ray study showed marked deviation of the trachea to the left with a foreign body at the level of the 7th cervical vertebra. There was considerable oozing of blood from the external wound. At 10:00 p. m. under ether anesthesia administered through an endotracheal tube an incision was made along the anterior border of the right sternomastoid muscle. The common carotid artery was exposed and provisionally controlled. This, however did not control hemorrhage from the wound but pressure over the subclavian deep in the wound permitted exploration in a dry field. It was found that the single metal fragment had severed the right vertebral artery at a site proximal to its entrance into the vertebral foramen and in addition lacerated irregularly the right common carotid artery. The nature and extent of the laceration in the carotid did not warrant suture. Ligations of both vessels proximal and distal to the site of injury were done. The damaged portion of the carotid was excised. The wound was loosely closed. He was given 500 cubic centimeters of blood during surgery. The postoperative course was uneventful during the 5 days of observation. There were no

mental cerebral, or peripheral nervous system changes. He was out of bed on the fourth day, talked with his parents and ate his meals without difficulty. Because of the tactical situation he was evacuated to the rear and observation beyond the 5th postoperative day was not possible.

It would be desirable to have had more detailed follow up data in this case. The injury to two of the four vessels which carry blood to the brain did not appear to have had an unfavorable effect on this youngster during the time of observation. The internal jugular vein was not injured and was not occluded.

CASE 7. Sgt. J. aged 25 was injured October 13, 1944 7:30 p. m. by a shell fragment which penetrated the right side of the neck posteriorly and lodged in the right supraclavicular fossa. He was admitted to the hospital at 2:10 a. m. October 14. Swelling and tenderness were present on the right side of the neck with oozing of blood from the irregular wound over the right trapezius muscle. A supraclavicular incision exposed the tract of the missile. The foreign body was lodged against the damaged transverse cervical artery which had an aneurysmal dilatation at the site where it passes between the cords of the brachial plexus (Fig. 7). All bleeding vessels were ligated, damaged tissue was removed and the wound was left open. No unusual symptoms were present or developed in the immediate postoperative period and he was evacuated to the base hospital on October 19, 1944.

This type of trauma illustrates vessel injury without penetration perforation or severance. It is likely that many injuries similar to this occur unassociated with immediate hemorrhage. Some are followed by hemorrhage when sloughing or perforation of the damaged vessel occurs. Others develop aneurysms which require ablation at a later day.

CASE 8. Lt. M. Italian soldier aged 25 years, sustained shell fragment wounds of his face, neck and shoulders at noon October 28, 1944, and was admitted to the hospital at 7:45 p. m. of the same day.

On admission he was in a state of shock and blood pressure when obtainable was 80/20. He improved following 500 cubic centimeters of whole blood. There was a small laceration of the face, a few wounds of the left shoulder and a lacerating wound of the left side of the neck 2 inches long at the level of the larynx. A large irregular foreign body was inclosed in the left supraclavicular fossa at the site of a welling. Under nitrous oxide-oxygen-ether anesthesia the left side of the neck was explored through an incision along the anterior border of the sternomastoid muscle. The superior thyroid artery and vein were severed and a defect was present in the superior pole of the left lobe of the thyroid. The internal jugular vein was extensively lacerated over a considerable distance. Hemorrhage was controlled by the positioning of stick sponges at sites proximal and distal to the bleeding vessel. All bleeding points were ligated. The internal jugular vein was ligated high and low and all damaged tissue with the foreign body was removed from the wound. Loose closure of the wound was done. No unusual changes developed and he was evacuated on November 8, 1944 in good condition.

Bleeding from a large vein is at times more troublesome than bleeding from a large artery. Extreme care must be exercised to prevent tearing of the vessel when efforts are made to control bleeding. Gentle compression over the wound and careful dissection with instruments that are smooth aid considerably in placing ligatures properly.

CASE 9. Pvt. F. aged 29 years was injured July 8, 1944 by a shell fragment which perforated the neck. The entrance wound was on the left side at the level of the chin and the exit was on the same side below the mastoid process. There was some swelling in the anterior triangle of the neck but no tenderness and little pain. Some difficulty in breathing was experienced. Examination showed the larynx, glottis, left tonsil, and posterior pharynx edematous. Intratracheal intubation was accomplished under nitrous oxide-oxygen-ether anesthesia. Through an incision parallel to and below the inferior margin of the mandible the tract of the missile was exposed. The internal jugular vein was completely transected, were the venous tributaries from the submaxillary gland. The missile passed posterior to the carotid artery without injury to this vessel. All bleeding points were ligated, but control of bleeding from the cephalic end of the jugular vein was difficult because of retraction of the vessel. By the use of a silk suture applied to the bleeding site with fixation in the adjacent sternomastoid muscle it was possible to control the bleeding without damage to adjacent structures. Recovery was uneventful and the patient was evacuated to the base hospital on July 17, 1944.

In this particular case as well as in several others where the source of the bleeding is a

large vein it is of the utmost importance to refrain from using forceps to control bleeding points. Veins have thin walls, tear easily and have a tendency to permit blood to well up into the wound. The use of stick sponges to block out the zone of bleeding with a systematic approach to the site of bleeding for careful isolation of the vessel before ligation or suture is done are most helpful in the control of hemorrhage.

In some cases it is found that ligation of the internal jugular vein permits a sac filled with blood extending from the ligated cardiac end to the next distal tributary. It is desirable to ligate the vein adjacent to the nearest tributary to prevent this blind sac from existing. In wounds that are contaminated from penetrating and perforating foreign bodies, the dangers of thrombosis, phlebitis, and sepsis warrant the removal of all stagnant accumulations of blood.

RÉSUMÉ

This series of vascular injuries in the neck does not represent all the patients with vascular injuries admitted to this hospital. However the cases not recorded here represent for the most part injuries to the external anterior and internal jugular veins and such smaller vessels which were available in the wound without extensive loss of blood or hematoma formation. The one death in this series is recorded in some detail (Case 5).

From a review of these cases it appears that the following general comments are warranted:

1. Vascular injuries in the neck are not common but are serious and may be fatal.
2. Blood for replacement of that lost either before or during surgery must be available at hand and ready for use.
3. Anesthesia must afford a high oxygen intake. A competent anesthetist familiar with the necessary techniques and conscious of the special needs of the patient with this type of injury is a valuable asset. Local anesthesia for an elective procedure may be desirable to avoid anoxia that may be associated with general anesthesia. However a recently injured patient in full knowledge of his injury especially when some dyspnea is present is very anxious to be put to sleep. In addition

where the exposed wound is obscured by blood and damaged tissue complete anesthesia with novocain may not be possible. A seriously wounded patient should not be subjected to physical or mental pain with incomplete anesthesia. Also a struggling patient cannot co-operate and a bleeding neck wound requires a deliberate and careful approach to prevent adding to the damage done by the missile. It is noteworthy that almost all of the patients with neck wounds done at the hospital were awake immediately after surgery was completed following nitrous oxide-oxygen ether anesthesia which was administered by a competent anesthetist using the endotracheal technique.

4 Ligation of vessels should be done at sites free from trauma and adjacent to branches or tributaries to prevent thrombosis in the 'blind segment'.

5 It is noteworthy that in those patients who sustained wounds of the neck involving blood vessels, injury to the larynx trachea, pharynx or esophagus or both were rare (Case 5—trachea and larynx, Case 2—trachea). In another series of 10 patients who sustained injuries involving the larynx pharynx or esophagus or both there were no large vessel injuries.

6 Ligation of the carotid artery soon after trauma is usually not followed by mental cerebral or peripheral changes in the age group noted in this series. It is obvious that occlusion of the common carotid or the internal carotid results in a marked diminution in the blood supply to the brain. It is difficult to explain why in some patients this brain anoxia is temporary and not destructive of the functions of the brain while in others changes

of great severity rapidly ensue. Many theories have been offered but there is probably no one which will satisfactorily explain the phenomenon in every case.

The dangers associated with ligation of this important vessel warrant the use of reconstructive methods and anticoagulants.

7 Venous bleeding in the neck is best controlled by careful isolation of the damaged vessel ligation of the bleeding point or when necessary suture of the bleeding site.

8 While the prevention and control of infection was based on the surgical principle of decompression of fascial spaces by incision all of the patients were given sulfadiazine or penicillin. The former was given routinely in 5 gram doses daily for 5 to 7 days to patients admitted prior to May 1944. The latter was given in 25 000 unit doses intramuscularly every 3 hours for 5 days subsequent to May 1944. The rôle these agents played in the prevention or the control of infection in these patients was the same as in other patients with wounds elsewhere on the body.

SUMMARY

In patients requiring immediate control of bleeding from a large vessel in the neck, adequate blood replacement before and during surgery is necessary. An anesthetic offering a high oxygen content with free passage of oxygen into the lungs is imperative. Thoughtful planning for provisional control of bleeding from an injured vessel will avoid unnecessary loss of blood. Excision of damaged tissue will prevent to some degree thrombosis and embolism. Cleansing of the contaminated wound and the use of penicillin helps to avoid infection and its sequels.

IMPROVEMENT IN ABDOMINAL HYSTERECTOMY MORTALITY

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IN a previous report from Harper Hospital¹ we published the death rate for abdominal hysterectomy (excluding pelvic malignancy hysterectomy after cesarean section and for obstetrical emergencies such as ruptured uterus) during the 5 years 1928-1932 inclusive. Mortality rates for total and subtotal hysterectomy were respectively 6.4 and 2.6 per cent. In view of the changes in pelvic surgery and the general improvement of surgical mortality in all fields in recent years, we undertook a similar study of results for the 5 years 1941 to 1945. Comparing the mortality rates, and excluding as before, all hysterectomies for pelvic malignancy and obstetrical emergencies a striking difference was at once apparent.

	1928-1932			1941-1945		
	Cases	Deaths	%	Cases	Deaths	%
Subtotal hysterectomies	14	30	6	14	7	50
Total hysterectomies	117	5	6	117	6	64
	(17.5)			(26.7)		
All cases	131	35	2	131	13	22

The dramatic improvements for all groups shown in this comparison of results, as well as the near equality of mortality rates for total and subtotal hysterectomies in the latter 5 years, prompted us to undertake a study of all abdominal hysterectomies performed at Harper Hospital for the entire period 1928 to 1945 inclusive. Thus there would be not only a comparison of two 5 year series from different periods, but also a record of the transition years between. It was thought that such investigation would better determine the factors responsible for the improved results now obtained and could lead to valuable sugges-

tions for further betterment. In order to present the complete picture, we decided to include consideration of *all* abdominal hysterectomies i.e. those done for pelvic malignancy and obstetrical complications as well as the benign conditions. Actually however this changed the mortality figures only slightly and simplified calculations. This inclusion moreover now permits comparison of results with series from other institutions.

ABDOMINAL HYSTERECTOMIES 1928-1945

The complete series comprises 6692 abdominal hysterectomies of which 2,050 (30.7 per cent) were total hysterectomies. These operations were performed by approximately 100 gynecologists, surgeons, occasional operators and residents in training representing varying degrees of skill and experience.² The women operated upon were, in the vast majority private patients. The operations contained examples of virtually every known technical variation in the performance of abdominal hysterectomy. The differences in technique, however, were not sufficiently clear-cut to permit classification and comparison of methods during this period.

Incidence of hysterectomies (Fig. 1) shows the numbers of abdominal hysterectomies performed each year from 1928 to 1945 as well as the numbers of complete and subtotal operations compared to the yearly totals. The increasing employment of hysterectomy during the 18 year span in spite of no increase in hospital beds or appreciable additions to the staff suggests a growing tendency to substitute ab-

In our first publication the importance of experience of the operator as judged by the numbers of hysterectomies performed, was clearly demonstrated. However, since the last 5 years of the series fell within the 18 years, the consequent absence of many of the staff of all age groups for variable periods, any estimate on the basis of operations performed would obviously be of questionable value, particularly when compared to the original series. Consequently this method of calculation was not attempted in the present study.

From Harper Hospital and Wayne University College of Medicine.
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R. S. Siddall and H. C. Mack, Surg., Gynecol. & Obst., 422, 66, 62.

Cases

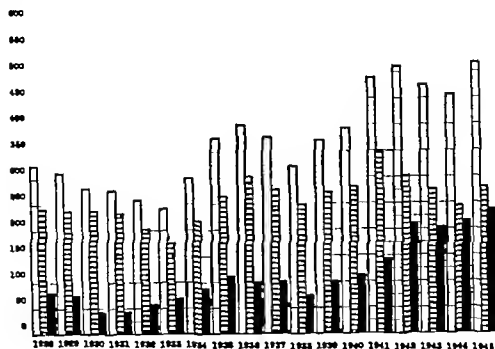


Fig. 1. Incidence of hysterectomies. White columns, all abdominal hysterectomies; crosshatched areas, supravaginal hysterectomies; black areas, panhysterectomies.

dominal hysterectomy for other gynecologic procedures.

In addition to the increased election of abdominal hysterectomy there is evident also a steady growth in selection of the total operation. Whereas, in 1928-1932 only 20.7 per cent of all abdominal hysterectomies were of the complete variety, the 5 years 1941-1945 showed that this proportion had doubled (41 per cent). It is noteworthy that this increase in the choice of panhysterectomy occurred in spite of the virtual abandonment of radical hysterectomy for carcinoma of the cervix in favor of radium and roentgen ray therapy in recent years. In view of this curtailment the selection of the total operation has obviously been extended for other indications.

Mortality. Among the 6,692 abdominal hysterectomies there were 119 deaths. An analysis of the mortality for the various groups as given in Table I shows a remarkable decrease in the death rate from 3.7 per cent in the years 1928-1932 down to 0.78 per cent in the 1941-1945 period, with the intervening years 1933-1940 at 1.65 per cent. Expressed differently, the risk in each of the last two periods was less than one-half that of the previous one. Moreover, this dramatic improvement

has occurred with both the total and subtotal operations.

TABLE I—COMPARISON OF MORTALITIES FOR THE THREE PERIODS AND FOR SUPRAVAGINAL AND PANHYSTERECTOMY

	1928-1932			1933-1940			1941-1945		
	Cases	Deaths	Per cent	Cases	Deaths	Per cent	Cases	Deaths	Per cent
All cases	3,456	14	3.7	785	46	6.3	2,115	9	0.78
Subtotal hysterectomy	55	2	3.6	203	23	6.2	447	1	0.76
Total hysterectomy	90	2	2.2	720	1	7.1	804	8	0.82

The most striking feature of Table I is the improvement in panhysterectomy mortality. While the risk of the subtotal operation has been reduced very substantially down to a figure between one third and one-fourth the total hysterectomy mortality in the last group was only one-ninth of that of the first 5 years. This means that total hysterectomy, which was more than two and one half times as dangerous as supravaginal in the first 5 years, reached near equality in the last two periods. The mortality percentage for the two types of operation by years is shown in Figure 1. It is

noteworthy that in the years 1941 and 1942 there were 352 consecutive panhysterectomies without fatality.

The approach to pancy in mortality of the two types of hysterectomy would seem to in validate the conclusion in our first report that, in view of the greater risk at that time total hysterectomy was not justified *routinely* as a prophylactic procedure against carcinoma of the cervix. Certainly the tremendous improvement in results now permits a very wel come extension in the use of the complete operation. Nevertheless there are several reasons to believe that the mortality figures of the two operations are not altogether com parable and consequently do not give the true picture regarding the relative operative dangers. This is evident from the fact that in accord with prudent surgical judgment the poorer risk patients tend to have the less for midable operation except in the rather few instances where panhysterectomy is absolutely imperative. It is interesting to note that this selection of poor risk patients for supravaginal hysterectomy seemed to apply to instances of malignancy as well as to benign conditions. For example, in 1941-1945 the two patients with malignancy who died after panhysterec tomy were without question in excellent con dition in one case and a fairly good risk in the other. In contrast, of the three fatalities after subtotal hysterectomy during this same per iod one was 74 years old with marked anemia renal insufficiency and peritonitis another had marked anemia, evidence of intestinal obstruction due to widespread peritoneal im plants from ovarian carcinoma, and weighed 260 pounds and the third died of peritonitis following perforation of the bowel while the pelvic organs were being freed of adhesions. This third case is an example of the fact that it is also fairly common practice to change preoperative plans for total hysterectomy to subtotal removal because of operative acci dents, unexpected technical difficulties or the necessity for speedy conclusion of the operation. Obviously in these circumstances an in advisable persistence in carrying out the more extensive operation would without fail sub stantially increase the mortality rate. More prudent selection of cases must have played

an important part in the reduced mortality of panhysterectomy in our later series.

Causes of death. To determine the causes of death in the 119 fatalities in this series was probably the most difficult portion of the study. Incomplete records as well as inade quate clinical and laboratory data were promi nent shortcomings, especially in the earlier cases. In the absence of adequate blood studies and blood pressure records, it was fre quently necessary to glean the criteria for the probable diagnosis from data given in the nursing notes often more informative than progress notes of the attending and resident staff. Where ample information was avail able the data were at times contradictory and often there were confusing multiple contribu tory causes. Even in a few cases with com plete postmortem examination considerable doubt as to the primary cause of death existed. Table II summarizes our best estimate of the causes of death.

TABLE II—CAUSES OF DEATH

	Entire series		1940-1943		1944-1946		1947-1948	
	N	Per cent	No	Per cent	No	Per cent	No	Per cent
All causes			54		46		30	
Peritonitis (infection)	64	53	23	64	23	50	6	21
Hemorrhage (shock, cardiac)	7	5	8	2	14	30	5	16
Embolus	14		9	7				11
Pneumonia		6			5			5
Aplasia	3							
Diabetic coma								
Uremia								
Meningitis								
Associated carcinoma		18		2	2		1	16

From Table II it is immediately apparent that infection, hemorrhage with shock and cardiac failure and embolus play the principal rôles in the entire series. The interchange of the last cause with pneumonia in the second period is probably only incidental to the small numbers involved. In assigning the principal causes of death after review of the case records, the combination of anemia (preoperative or resulting from operative blood loss) and in-

fection (peritonitis ileus) in the same patient frequently made it difficult for us to determine which factor was primary. Similarly many instances of probable surgical shock with early fatal outcome had originally been catalogued as myocardial failure. Acknowledging valid objections to including deaths from shock and hemorrhage with those of cardiac failure we have continued this grouping (as in our first publication) to facilitate comparison between the groups and also because of the difficulties of differentiating between these conditions through lack of adequate clinical and laboratory data. Regardless of the acknowledged shortcomings of such *ex post facto* deductions it is possible to ascertain certain trends in the preoperative and postoperative care of these cases which may explain some of the improvements attained.

In Table III are given the causes of death with subtotal and total hysterectomy for the 5 year periods 1928-1932 and 1941-1945. The figures demonstrate marked improvement for both types of operation. They also show again that in spite of this improvement the same causes of death are important now as before.

TABLE III.—CAUSES OF DEATH WITH SUBTOTAL AND TOTAL HYSTERECTOMY

	All cases		Subtotal hysterectomy		Total hysterectomy	
	1928-32 (1435)	1941-45 (445)	1928-32 (317)	1941-45 (417)	1928-32 (303)	1941-45 (404)
Peritonitis (infection)	35	0	8	2	7	—
Emboli	—	—	—	—	—	—
Hemorrhage (shock, etc)	8	8	6	—	3	—
Pneumonia	—	—	—	—	—	—
Apoplexy	—	—	—	—	—	—
Diabetes	—	—	—	—	—	—
Uremia	—	—	—	—	—	—
All causes	44	9	14	2	10	—

ANALYSIS OF CAUSES OF DEATH

Gratifying as it is to report the great improvement in the mortality results for hysterectomy at Harper Hospital the most important function of this study is an inquiry into measures for further betterment. Most promising for that purpose appeared to be

further analysis of the major causes of death to discover improvements in treatment which could have been responsible for the lowered mortality of the later periods. It was hoped that in this way leads to further improvement might become evident.

Infection As is shown in Table II postoperative peritonitis was numerically and proportionately the greatest contributing factor to mortality in the entire series and in each of the three time intervals. Of all patients subjected to hysterectomy during the 18 year period 0.95 per cent died as a consequence of infection. It was the cause of death in 0.75 per cent of supravaginal and 1.4 per cent of panhysterectomy operations. A dramatic contrast however is evident when we calculate the incidence of fatal peritonitis in the three periods represented in this series in 1928-1932 it was 2.4 per cent in 1933-1940 it declined to 0.82 per cent and in 1941-1945 it reached the low figure of only 0.24 per cent. In other words the risk of death from peritonitis in the last 5 year span was only one tenth that of the first series. A similar decline was noted when the death rate for peritonitis was calculated according to type of operation per rates per cent were 1.5, 0.58 and 0.34 respectively for the three time groupings and for 0.1 per cent respectively.

In attempting to explain this striking lowering of the death rate from infection several potential factors were considered (1) incidence of malignancy (2) incidence of acute salpingitis (3) preoperative and postoperative treatment of anemia (4) chemotherapy.

Malignancy The frequent sequel to pelvic surgery for malignancy namely peritonitis has long been recognized. The fact however that death from infection has diminished despite a proportional increase in deaths associated with malignancy (Table II) would make it seem likely that some factor other than a lowered incidence of malignancy in recent years accounts for the declining death rate from infection.

Salpingitis A partial explanation for some lowering of the death rate from infection is found in the declining frequency of operations

for 'pus tubes.' Among the 64 peritonitis (infection) deaths in this series, there were 9 with pathological evidence of acute or sub-acute salpingitis. It seems significant that 7 of these deaths occurred in the 5 years 1928-1932 2 were recorded in 1933 1940 and none such were noted in 1941 1945. These figures suggest that selection of patients with respect to preoperative pelvic infection contributed to a lowering in the infection death rate. The fact however that infection was fatal only one-sixth as often in 1941 1945 as in 1928-1932 makes it likely that other factors were also responsible.

Preoperative and postoperative treatment of anemia. In an attempt to determine the effect of preoperative and postoperative treatment of blood loss upon the mortality of hysterectomy we have investigated the incidence of blood transfusions among all patients subjected to hysterectomy. We have also calculated the frequency of transfusion among those who died following hysterectomy on the assumption that this might give a clue as to the energy with which these serious cases were treated. Grouped in 2 year periods these relationships are shown in Table IV.

TABLE IV—RELATIONSHIPS OF HYSTERECTOMY MORTALITY TO FREQUENCY OF PREOPERATIVE AND POSTOPERATIVE BLOOD TRANSFUSIONS

Years	No.	Deaths		Infection deaths		Hysterectomy transfused		Hysterectomy deaths transfused	
		No	Per cent	No	Per cent	N	Per cent	No	Per cent
1923-29	637	30	7	73	3.6	7			
1930-31	330	13	3	6	6	3	6	3	20.6
1932-33	303		6	6		15		5	41.4
1934-35	677	3		6	73		6		0
1936-37	779			5	4.1	47	6		
1938-39	603	3	8	8	3	67	9.6	6	66
1940-41	681	8			43		1.5		16
1942-43	960			6	30	30.7	30		37
1944-45	971	9	9		10	most tabulated			33.3

It seems evident from Table IV that the decline in general mortality and in death from infection bears a relationship to or at least

parallels, the increasing use of preoperative and postoperative blood transfusions. Not only was this measure employed more frequently in all cases but also its increasing use in the critically ill who subsequently died indicates more energetic treatment with this accepted measure against the two closely related complications of blood loss and infection. It seems more than a coincidence to relate the lowest mortality rates to the years with the highest incidence of blood transfusion.

As a matter of historical interest, at Harper Hospital, blood transfusions in the early years were performed by the technically difficult direct method of blood transfusion. The introduction of the simple vacoliter method of indirect transfusion relegated the direct transfusion technique to virtual disuse since 1937. The blood bank was established in 1938. The impetus given to blood transfusions by the simplified indirect method and the blood bank is shown in the increased incidence of transfusion since 1937 and 1938. It seems reasonable to us that the increasing use of transfusion has been the largest single factor in the reduction of hysterectomy mortality in our series. The fact that a steadily increasing proportion of patients who died following hysterectomy were transfused is indicative of more intensive and efficient postoperative care and the recognition of the importance of blood loss as a contributing factor in many postoperative complications other than massive hemorrhage. It is heartbreaking to read the case histories of early fatalities which might have been avoided by this means. It is difficult to explain also why blood transfusion was not more energetically employed in a certain number of even recent deaths. Since 1943 blood transfusions have become such a commonplace feature of hospital practice that they are no longer cross-indexed in the hospital record room hence figures for transfusion in hysterectomy are not available for 1944 1945.

Chemotherapy. To evaluate the effect of chemotherapy and antibiotics would require a separate study of each of the 3 537 cases of hysterectomy since 1938 when sulfa therapy was first attempted in one of the patients who died from peritonitis after removal of the uterus. From 1938 to 1945 sulfa therapy was em-

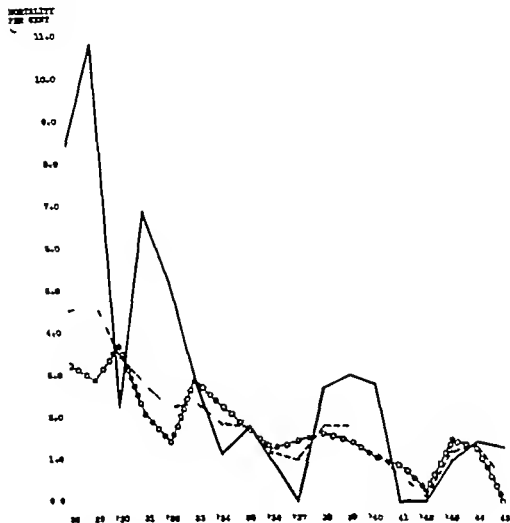


Fig. 2 Mortality percentages. ---- all abdominal hysterectomies o-o-o-o supravaginal hysterectomies — panhysterectomies.

played in 15 of the 37 patients who died during that period 16 deaths during this time being ascribed to peritonitis. In a large proportion of these deaths, particularly in the early years dosage was entirely inadequate as judged by present standards. Most often it was not only too little but also too late. To judge properly the effectiveness of chemotherapy would require an analysis of all morbid cases comparing the results of those treated and not treated by sulfonamides or antibiotics. This method of therapy is not crossindexed in our record room and hence this valuable part of the study was not undertaken. Suffice it to say that despite its obvious benefits other factors in the selection of patients and in preoperative and postoperative care had already lowered considerably the death rate before the beginnings of chemotherapy after 1938 (Fig 2)

Hemorrhage Deaths related to hemorrhage shock and myocardial failure (acknowledging again the questionable justification for including the last, as explained above) accounted for 27 deaths or 0.40 per cent of all hysterectomies. While shock and cardiovascular collapse as a sequence to bleeding still occupy a prominent place among the causes of death listed in Table III, the frequency of this complication shows a demonstrable decline during the succeeding time periods of this series in 1928-1932 it was 0.54 per cent 1933-1940 0.50 per cent 1941-1945 0.20 per cent. This improvement again can probably be explained by the increasing resort to blood transfusion notably since 1936 as shown in Table IV.

Embolism Postoperative embolism accounts for the third major cause of death in this series occurring in 0.20 per cent of all hys-

tributed to fatalities. Of the several possibilities there was only one point concerning which any definite data were obtainable. Two of the 10 deaths of the 1941-1945 series were almost certainly attributable to postoperative intra abdominal hemorrhage. Furthermore, in these cases the thought is inescapable that better treatment in the way of timely reopening of the abdomen probably and more extensive use of blood transfusion more certainly might well have changed the outcome. In another instance, reoperation and replacement of blood lost were successfully accomplished though the patient died of pneumonia 4 days later. Quite possibly the early complication contributed to the fatality. These cases will be mentioned again.

REVIEW OF MORTALITY IN 1941-1945 PERIOD

A review of the deaths in the last 5 years was undertaken with the idea that, in view of the information now available, important points for further improvement might be revealed. In Table II it was shown that in spite of marked reductions the principal causes of death in the 1941-1945 period were the same as in the first that is infection or peritonitis hemorrhage with shock and cardiac failure and pulmonary embolism. These causes, accordingly offered the most fertile field for investigation.

A study of the case histories of the fatalities from peritonitis and infection leaves one with the distinct impression that different treatment might have changed the outcome in the majority. For example, in one case no chemotherapy at all was given and in another it was not started until the day of death. Both of these cases occurred in 1943. In two patients anemia of profound degree was insufficiently treated preoperatively in one and not at all in the other. Moreover in the former a hemoglobin reading of just 40 per cent resulted from the one and only postoperative transfusion. In a fifth patient, 10 grams of sulfanilamide placed in the peritoneal cavity after the bowel therapy and though two blood transfusions were given the resulting hemoglobin level was only 30 per cent. The sixth patient apparently received every possible aid without results be

cause of widespread carcinomatosis peritonitis and coronary thrombosis as shown by postmortem examination.

Of the 4 deaths due to pulmonary embolus there were two of the usual type occurring on the fifth and ninth postoperative days with apparently no suspicion of trouble preceding the accident. Another was stricken when she was to all appearances uneventfully convalescing 12 days after wound disruption and resuture. The fourth died suddenly 15 days after operation during the last 7 of which the patient had been allowed out of bed despite daily temperature elevation ranging between 101.4 and 102.4 degrees. Due to lack of adequate clinical data in these cases comment on the feasibility of vein ligation must be deferred. Certainly in the last case one might seriously question the advisability of amputation in the presence of obvious infection.

Acknowledging again the questionable propriety of grouping deaths from shock hemorrhage and heart failure we repeat that this was done (1) to permit comparison with our first series and (2) because these conditions were difficult of differentiation in certain cases. As an example of the latter a patient with mitral valve insufficiency expired on the operating table in the course of the difficult removal of a densely adherent myomatous uterus. In view of the precarious condition of the patient one might well question the wisdom of undertaking the operation in the first place or of continuing it after the abdomen was opened and the probable dangers were demonstrated. Quite possibly not one week following operation after 36 hours of coronary occlusion but with a considerable possibility of pulmonary embolism as the true cause. Another a 49 year old woman on the eleventh postoperative day and 5 days after secondary wound closure for evisceration died rather suddenly with no pertinent postmortem findings other than moderate basilar lung congestion and acute cardiac dilatation. The two remaining cases were mentioned under the discussion of operative technique as instances of postoperative intra abdominal hemorrhage with the distinct possibility of a different re

sult had treatment been more timely and energetic in the control and replacement of the blood loss.

Of the remaining 4 patients one who was known to have marked hypertensive disease died on the seventh day from renal insufficiency and apoplexy after removal of a fibroid uterus and large ovarian cyst. Another died of uremia 2 weeks after cesarean section and supravaginal hysterectomy for severe premature separation of the normally implanted placenta with marked hypertension (200/120) and albuminuria. The third died in diabetic coma 6 days after operation in spite of all that could be done. The advisability of operation on this patient for a chronic condition even though there was marked disability might be questioned. The last patient was the third case discussed under operative technique. She was successfully operated upon for postoperative and intra-abdominal hemorrhage was transfused adequately but died 4 days later of pneumonia in spite of all treatment. What part the early and probably preventable hemorrhage might have played in initiating the pneumonia cannot be determined.

From this analysis it would appear that in at least 11 of the 19 cases one or more preventable factors featured the preoperative or postoperative care or operative technique which to some degree influenced the fatal outcome. While one must charitably concede mitigating circumstances in certain instances, the faults (notably of omission) in others are obvious, even allowing for the greater wisdom and clarity of hindsight. It seems evident that further improvement of hysterectomy mortality can be attained only by more energetic employment of the factors which we believe accomplished the good results in the latter years of our series. Perhaps it is not too much to hope and expect that by continuation of such treatment the death rate in the next 5 year period will again be reduced 50 per cent.

SUMMARY

A review of the 6 692 abdominal hysterectomies performed at Harper Hospital from 1928 to 1945 inclusive, revealed a marked decline in mortality. In an effort to determine the factors responsible for this improvement, a comparison was made of the results during the first and the last 5 year periods and for the intervening years of the series. This study showed that along with an increase in the numbers of hysterectomies of all types there was also a steady growth in the proportion of total hysterectomies. The mortality curve for the 18 year span demonstrated a consistent lowering of the death rate for hysterectomy from 3.7 per cent in the first 5 year group to 0.78 in 1941-1945. Subtotal hysterectomy mortality declined from 2.8 to 0.76 per cent, while the panhysterectomy deaths dropped from 7.3 per cent to 0.80.

In an investigation of the principal causes of death it was found that while infection, hemorrhage (shock and heart failure) and embolism played the main rôles their incidence in the last 5 year group was greatly reduced over that of the first period. The part played in this reduction by various factors such as better selection of cases, blood transfusion and chemotherapy was considered. It seemed evident that the greatest responsibility in the lowering of hysterectomy mortality was ascribable to the increasing use of blood transfusion. This factor antedated the advent of chemotherapy which probably also caused some improvement though not statistically shown in this series.

An analysis of the last 5 year period in the light of the data derived from this study indicated that in 11 of the 19 deaths a more careful attention to certain potent features of preoperative, operative, and postoperative care might have accomplished a different result. It is suggested that future improvements in mortality rates can be achieved by more energetic application of these beneficial factors.

STRANGULATED FEMORAL HERNIA SURGICAL MANAGEMENT

J PARRAN JARBOE, M.D., and JOSEPH H PRATT M.D. Rochester Minnesota

A FEMORAL hernia is more likely to undergo acute strangulation than is any other type of hernia. Strangulation may occur at any time and often under the most unfavorable circumstances. When a femoral hernia becomes acutely strangulated it constitutes an urgent surgical emergency that requires prompt diagnosis and early operation. The time element is one of the most important factors affecting the prognosis. The seriousness of this disease may be attributed to the frequency with which a segment of small intestine is strangulated and to the rapid development of pathologic degeneration in the constricted portion.

On many occasions emergency operations for acute strangulation in such a situation necessarily are performed by younger surgeons. Often these well trained but less experienced surgeons are somewhat dubious concerning the proper surgical management of strangulated femoral hernia, especially when dealing with the contents of the hernial sac. It is a well known fact that often when circumstances are more unfavorable even the widest surgical experience and judgment may prove to be inadequate and fallacious. The surgeon's decision and technical skills exercised at the operating table may have a profound effect on the end results. Under such confusing and extraordinary conditions the use of certain operative procedures may contribute greatly to the unfavorable postoperative results frequently encountered in the condition under consideration.

Hence, it is essential that every surgeon who performs emergency operations familiarize himself with the accepted methods and technical procedures for overcoming the many problems presented by a strangulated femoral

hernia. For successful management of acute strangulation and to assure a more favorable prognosis it is necessary for the younger surgeon especially to exercise his best surgical judgment and technical skills in adapting routine operative procedures to the individual case.

Many treatments have been proposed for the surgical management of strangulated femoral hernias and each one has its particular advantages. However, because acute strangulation in every instance requires prompt attention and individual consideration the time element does not allow for an appraisal of the many suggested methods of management at the operating table. Unfortunately trial and error treatment is practiced in far too many cases. Perhaps this empirical procedure may be an important factor in the persistence of the high fatality rate in cases of atrangulated femoral hernia.

To learn as much as possible about the management of strangulated femoral hernias a recent comprehensive study of 104 patients treated surgically at the Mayo Clinic during the period from 1907 to 1946 has been made by one of the authors (Jarboe). Believing that the observations and conclusions derived from this review may be helpful to other surgeons in determining the proper surgical management of patients who have acutely strangulated femoral hernia, the authors have collected the investigative findings for discussion. An analysis and evaluation of the surgical management exercised in the 104 cases may be of value in formulating new proposals of treatment that may result in a more favorable outlook for the patient who has a strangulated femoral hernia.

To treat any femoral hernia successfully the surgeon should possess adequate knowledge of the anatomic relationships in the femoral and inguinal regions and he should be familiar with the physiologic and pathologic

Abridgement of portion of thesis submitted by Dr. Jarboe to the faculty of the Graduate School of the University of Minnesota in partial fulfillment of the requirements for the degree of M. S. in Surgery.

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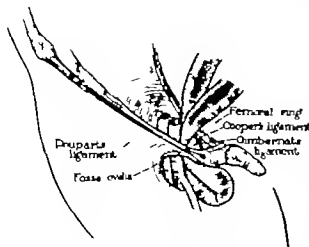


Fig. Anatomic aspect of femoral hernia, showing a loop of intestine strangulated at the femoral ring.

conditions created by acute strangulation. Since femoral and inguinal hernias often are misdiagnosed it follows that the surgeon must attain to a sound and extensive knowledge of anatomy, physiology and pathology in order to be able to carry out differential diagnosis and proper operative management of the respective herniation.

ANATOMIC ASPECTS

Acute strangulation occurs more frequently in the presence of femoral hernias than in other types because the constricting site is the small rigid femoral ring through which herniation occurs. The oval shaped femoral ring is the internal opening of the femoral canal and it communicates with the abdomen. The femoral ring is bounded laterally by the femoral vein, anteriorly by the inguinal (Poupart's) ligament, medially by the sharp-edged lacunar (Gimbernat's) ligament and posteriorly by the superior ramus of the pubic bone, Cooper's ligament, pectineus muscle and fascia. The short femoral canal extends downward from the femoral ring and terminates at the fossa ovalis which is an aperture in the fascia lata of the thigh that is situated below the midpoint of the inguinal ligament and about 3 centimeters lateral to the pubic tubercle. These anatomic relationships are shown in Figure 1.

When strangulation takes place at the femoral ring the anatomic structures affected

are the hernial sac (formed from parietal peritoneum, preperitoneal tissues and transversalis fascia) and the contents of the sac.

CAUSE OF STRANGULATION

The actual cause of acute strangulation itself is mainly theoretic. It is assumed that femoral herniation occurs with increased intra-abdominal tension that forces the hernial sac and its contents to protrude through the femoral ring. If this herniation is prolonged, the sharp constricting edge of Gimbernat's ligament may inhibit the return of the femoral sac and its contents to the abdomen. Thus, an incarcerated femoral hernia is formed and this may become a strangulated hernia if venous compression and circulatory impairment should follow.

RESULTS OF STRANGULATION

When strangulation occurs, pathologic changes such as congestion, edema, diffuse hemorrhage, necrosis and gangrene take place in the constricted hernial sac. The hernial sac usually is small and globular but these characteristics often are altered by the volume and pathologic condition of the contents of the sac. Since a portion of small intestine is found very frequently in the strangulated hernial sac it is obvious that various degrees of intestinal obstruction often are associated with these hernias.

DIAGNOSIS

Acute strangulation of a femoral hernia is a common cause of acute intestinal obstruction among patients more than 50 years old; hence, the clinical diagnosis should not be difficult if the condition is given adequate consideration. However, the incidence of diagnostic error is high and is at times responsible for delayed operation.

A painful, tense mass in the groin had been present in 100 cases of the 104 concerned herein but the significance of this mass often was misinterpreted and was the commonest diagnostic error. In many cases in which the medical diagnosis was misleading, the patient's objective manifestations indicated to the surgeon the urgent need of immediate operation more so than did the diagnostic impressions.

It was often difficult to make the differential diagnosis between femoral hernia and inguinal hernia, so that in all cases in which the diagnosis was doubtful the latter condition was suspected. In such cases the anatomic relationships of the mass in the groin to the inguinal ligament and pubic spine may be helpful in diagnosis. Usually, a femoral hernia pushes forward and upward to override the inguinal ligament whereas an inguinal hernia makes the ligament more distinct. A femoral hernial mass can be palpated laterally and slightly inferiorly to the pubic spine whereas an inguinal hernial mass is palpated superiorly and medially to the pubic spine.

When a presumptive diagnosis of acute intestinal obstruction is made, especially in aged patients, it is the surgical consultant's ultimate responsibility to examine carefully all external hernial orifices to determine the presence or absence of an acutely strangulated hernia as an etiologic basis for the complaints. Careful examination of the hernial orifices is an important and significant part of every physical examination.

TREATMENT OF STRANGULATION

The one and only treatment for a strangulated hernia is immediate surgical operation. Valuable time should not be sacrificed in an attempt to reduce the strangulation by taxis because the fatality rate increases with each hour that operation is delayed. The prognosis is most favorable when operations are performed within 24 hours after the onset of acute strangulation.

Time element. In the 104 cases under consideration the elapsed time from the onset of acute strangulation until operation ranged from 1 day (fatality rate of 13 per cent) to 4 days (fatality rate of 70 per cent). The importance of the time element in all cases of strangulated femoral hernia cannot be overemphasized. The rapidity with which pathologic changes develop in the contents of the strangulated hernial sac is variable and cannot be ascertained until the sac is opened at operation.

In one case in which operation was performed 2 hours after the onset of clinical manifestations which indicated strangulation

TABLE I—TYPE OF SKIN INCISION EMPLOYED IN 104 CASES

Incision	Cases
Inguinal above and parallel to inguinal ligament	65
Femoral below and parallel to inguinal ligament...	7
Vertical over hernial sac	6
Low rectus...	3
Low midline	15
Not reported.	104
Total	

the hernial sac contained a loop of gangrenous small intestine. Generally pathologic degeneration develops slowly but in any case this progression can be interrupted only by surgical release of strangulation. Otherwise irreversible changes occur in the contents of the sac. Usually the responsibility for this unfortunate delay can be attributed to the patient who needlessly sacrifices invaluable time by postponing medical and surgical treatment until his condition becomes critical.

Anesthesia. The method of anesthesia employed for operation depended mainly on the clinical condition of the patient. Before 1932 when spinal anesthesia was first used in operations for strangulated femoral hernia general inhalation anesthesia with ether was the method used most frequently. For 23 critically ill patients local infiltration or regional block anesthesia was used. The lowest fatality rate however was noted in the 32 selected cases in which intraspinal anesthesia was the method of choice.

Because the majority of patients suffering from strangulation of a femoral hernia of several days' duration are very poor operative risks it is essential that each surgeon be thoroughly acquainted with the various anesthetic agents and routes of administration so that this knowledge can be utilized in the proper selection of anesthesia for each patient. In critically ill patients, the damage caused by strangulation and the extent of surgical intervention required cannot be determined preoperatively. For these reasons local infiltration anesthesia or carefully supervised spinal anesthesia is advocated in such instances. However in all cases of acute strangulation the method of anesthesia to be used should be adapted to the patient.

Skin incisions. There has been much comment on the relative merits of different surgical

TABLE II — STRUCTURES STRANGULATED IN
HERNIAL SACS IN 104 CASES

Structure	Number times involved
Small intestine	64
Omentum only	22
Omentum and viscera	
Urinary bladder	2
Sigmoid	4
Appendix	6
Meckel's diverticulum	2
Cecum	
Adenomyoma	1
Endometrial hematoma	
Total	125

cal approaches for exposure of a strangulated femoral hernia. The primary skin incisions that were used in operations in this series are listed in Table I.

The primary paramedian and midline incisions were made in 9 cases in which a strangulated femoral hernia was not suspected. In 5 cases a secondary inguinal incision was made when strangulation had been revealed.

Use of the vertical incision over the hernial mass or of the femoral incision below the inguinal ligament has been advocated by some surgeons. A small femoral incision below and parallel to the inguinal ligament gives poor exposure with little opportunity for investigation of intra-abdominal conditions. It is, however, the most rapid method of dealing with this surgical emergency. When it is employed the sac can be identified, exposed and incised and the contents noted—all within a few minutes. To treat the strangulated viscera properly however especially if a portion of small intestine is found in the hernial sac, it is often necessary to make a second incision in the lower part of the abdomen.

The inguinal incision when made 1 to 2 centimeters above and parallel to the inguinal ligament has been the surgical approach most preferred in exposure of a strangulated femoral hernia. According to Watson (1925) the inguinal incision has certain noteworthy advantages over the other approaches: (1) it affords the best exposure of the hernial sac and its contents; (2) constriction is quickly located and relieved; (3) an anomalous obturator artery is noted readily if it is present; (4) intestinal resection and anastomosis can be carried out easily without the exertion of trac-

tion on the mesentery; and (5) the incision permits inspection of the intestine above and below the point of strangulation. This incision however takes more time and is associated with an increased danger of peritoneal contamination with the contents of the hernial sac.

If exposure is adequate and the mesentery is sufficiently mobile intestinal resection and anastomosis necessitated in cases of strangulated femoral hernia should be performed through one inguinal incision. When resection is performed through either a femoral incision or an inguinal incision it should be remembered that prolonged traction on the mesentery often prevents the return of circulation to the bowel and may retard healing processes in the anastomosed loops. Douglas (1912) has pointed out the grave danger of contamination and peritonitis incident to the reduction and resection of a necrotic portion of intestine through a second abdominal incision.

In the series under consideration primary resection and anastomosis of necrotic segments of ileum were performed through an inguinal incision in 7 cases, with 3 deaths (a fatality rate of 43 per cent). Primary resection and anastomosis were performed through a femoral incision below the inguinal ligament in 2 cases. Necropsy in each of the latter cases revealed that insufficient portions of ileum and mesentery had been removed at resection, since there was residual necrosis of both loops of the bowel. Ileal resection and anastomosis were carried out through a secondary paramedian incision in 7 cases, with 5 deaths (a fatality rate of 71.4 per cent).

TREATMENT OF CONTENTS OF HERNIAL SAC

With proper precautions taken to minimize contamination attempts were made to release the constriction and to evaluate the viability of the contents of the sac. To facilitate reduction through the rigid femoral ring it was necessary to incise the lacunar (Gimbernat's) ligament medially in 24 cases. The inguinal (Poupart's) ligament was divided in 18 cases. Both ligaments were severed in 1 instance. An abnormal obturator artery was encountered and ligated on 2 occasions.

Contents of hernial sac. The abdominal and pelvic viscera that were strangulated in the

104 hernial sacs are listed in Table II. That the contents of the hernial sac have a significant effect on the fatality rate is revealed by the fact that in sixty four cases in which a segment or loop of small intestine had been strangulated there were twenty three deaths (a fatality rate of 36 per cent). In the forty cases in which strangulation of abdominal or pelvic structures exclusive of small intestine occurred (Table III) there was one death (a fatality rate of 2.5 per cent).

Viability of contents of sac. After release of the strangulation the determination of viability of the contents of the sac and the subsequent surgical treatment were considered. In 40 cases in which abdominal or pelvic structures exclusive of the small intestine were strangulated the decision as to viability was not difficult to make. Viability of the urinary bladder, cecum and sigmoid colon was assured after reduction of strangulation. The constricted portions of other structures (omentum, appendix, Meckel's diverticulum, adenomyoma and endometrial hematoma) were excised without incident in nearly all cases.

When a segment of small intestine had been strangulated in the hernial sac, determination of viability of the involved bowel after reduction was much more difficult, especially in cases in which the condition was intermediate. Viability was determined by observance of the return of arterial pulsations in the mesentery, and the return of a normal pink color and serosal luster to the affected segment of bowel. This physiologic recovery was stimulated by means of the application of warm saline compresses to the affected parts and by having the patient breathe pure oxygen. If circulatory improvement was not noted within 15 minutes the affected portion of bowel was considered to be nonviable.

These procedures for determination of the viability of involved bowel consume valuable time and prolong the operation unnecessarily. Consequently, after successful experimental and clinical trials in 500 cases, Herrlin, Glasser and Lange in 1942 proposed two methods for determination of the viability of strangulated bowel when viability is doubtful.

Method 1 — Fluorescein test.—After the doubtful, fully viable segment of bowel has been exposed, 3 to

TABLE III — DETAILS OF OPERATIVE PROCEDURES EMPLOYED IN 104 CASES AND HOSPITAL FATALITY RATES ACCORDING TO PROCEDURE EMPLOYED

Procedure	Cases	Deaths in hospital	
		Number	Per cent
Primary resection and anastomosis for gangrenous ileum	7	4	57.1
Primary resection and anastomosis for gangrenous ileum, with enterostomy in proximal loop of ileum	7	5	71.4
Enterostomy of gangrenous ileum with enterostomy and secondary resection			5
Reduction of gangrenous small intestine			00
Reduction of gangrenous small intestine plus enterostomy			00
Reduction of gangrenous small intestine plus enterostomy of necrotic loop			00
Reduction of gangrenous small intestine plus enterostomy of necrotic loop and enterostomy			00
Reduction of gangrenous small intestine plus invagination of necrotic part	3		67
Reduction of gangrenous small intestine plus invagination of gangrenous part and enterostomy			00
Reduction of gangrenous small intestine plus enterostomy			00
Reduction of nongangrenous small intestine	37	4	8
Reduction of nongangrenous small intestine plus enterostomy			
Reduction or excision, or both, of strangulated viscera, exclusive of small intestine	40		5
Totals	104	4	3

6 cubic centimeters of a 5 per cent solution of fluorescein is injected intravenously. The operating room is darkened and the bowel is observed under ultra violet light. Viable bowel produces a golden-green illumination; a nonviable segment remains dark.

Method 2 — Procarine test.—When amounts up to 10 cubic centimeters of a 2 per cent solution of procarine hydrochloride are injected locally around the mesenteric blood vessels, there is an immediate release of any vasospasm present, resulting in hyperemia and rapid improvement in circulation to the affected segment of bowel.

These investigators reported that these methods can be used singly or together with accuracy of 90 per cent for ascertaining the viability of bowel. They can be used therapeutically for improvement of the circulation to questionable portions. Although these procedures were not used in any cases of the series concerned herein, perhaps they deserve special consideration and utilization in future deter-

minations of viability of the bowel in doubtful areas.

When viability of the contents of the hernial sac was determined at operation methods were instituted for treatment of the nonviable portions of the strangulated viscera. Naturally the surgical management depended on several factors such as the amount of viscus strangulated within the hernial sac and the pathologic condition of the viscus concerned at the time of reduction.

To demonstrate the advantages or disadvantages of certain operative procedures commonly used in the surgical management of strangulated portions of small intestine the operative details of each case in the 104 concerned herein were reviewed and classified accordingly. The operative procedures used in the 104 cases and the hospital fatality rates associated with each procedure are summarized in Table III.

Fatality rate after treatment of contents of hernial sac. Strangulated and nonviable segments of ileum were removed in 16 cases with 10 deaths (a fatality rate of 62.5 per cent). In 10 cases the viability of the strangulated portion of small intestine was questioned but because of the patient's poor condition the segment was not removed. In these 10 cases there were 9 deaths (a fatality rate of 90 per cent). An obvious conclusion should be that although the fatality rate associated with primary ileostomal resection is high the fatality rate is much higher when questionably viable segments of bowel are returned into the abdomen without resection.

The high fatality rate associated with intestinal resection in the management of strangulated femoral hernia has been recognized and reported by many surgical investigators. Braun and Wortmann in 1924 reported a fatality rate of 50.4 per cent in cases in which resection was carried out. Frankau in 1931 reported a fatality rate of 42.8 per cent in such cases. McClure and Fallis in 1939 reported a fatality rate of 66.7 per cent. McNeely, Lichtenstein and Todd in 1942 reported a rate of 60 per cent and Jens in 1943 reported a fatality rate of 66 per cent in cases in which strangulated femoral hernia required resection of the small bowel. The fatality rate of

62.5 per cent associated with resection in this series thus compares favorably with other reported statistics.

In 40 of the 104 cases viscera other than the small intestine were strangulated in the hernia. The operative procedures used in the treatment of strangulated segments of the small intestine in the remaining 64 cases will be described and discussed separately. In this group of 64 cases, postmortem examination was performed in 20 of the 23 cases in which death occurred. A study of the necropsy reports has made possible practical evaluation of certain operative procedures and surgical judgments exercised at the primary operations.

The gangrenous portion of ileum was removed, anastomosis was carried out and the abdomen was closed without drainage in 7 cases, with 4 deaths (57 per cent). In addition to primary resection and anastomosis in 7 other cases an enterostomy tube was inserted into the proximal loop of the distended bowel. In these latter 7 cases there were 5 deaths (71.4 per cent). The removed portions of ileum and mesentery were from 6 to 45 centimeters long.

In 2 cases the gangrenous segment of ileum was exteriorized and removed according to a modified Mikulicz procedure and there was 1 death (50 per cent). In each case an enterostomy tube was inserted into the proximal portion of the exteriorized loop of bowel.

Intestinal anastomosis. After the necrotic segments of ileum and mesentery had been removed primary ileoileostomy re-established continuity of the small bowel in 14 cases. Side-to-side anastomosis was carried out in 6 cases, with 3 deaths (50 per cent). End-to-end anastomosis was performed in 8 cases, with 6 deaths (75 per cent).

Postmortem examination in 3 of the 8 cases in which end-to-end ileoileostomy had been performed revealed almost complete obstruction of the bowel at the site of anastomosis, in addition to leakage of foul liquid material through the gaping suture holes into the peritoneal cavity.

In 2 of the cases in which side-to-side anastomosis had been established results of necropsy indicated that the union had been satisfactory in one instance, but that in the other the stoma had been inadequate and had

caused partial obstruction with some distention of the proximal ileal loops. No evidence of leakage was reported.

On the basis of the end results in these cases it might be concluded that after removal of the nonviable segment and inversion of the cut ends of bowel re-establishment of intestinal continuity by side-to-side anastomosis is a safe surgical procedure especially for less experienced surgeons who might otherwise encounter considerable difficulty in anastomosing a distended hyperemic proximal loop end-to-end to the collapsed distal loop of bowel.

For the surgeon who encounters this type of hernia only occasionally side-to-side anastomosis has some advantages. (1) it permits satisfactory anastomosis of a dilated proximal loop of bowel to a collapsed distal segment with less danger of leakage of the fluid contents of the bowel into the peritoneal cavity. (2) the large stoma which is created assures adequate drainage of the distended proximal loops of bowel and reduces the possibility of subsequent obstruction at the stomal site. and (3) at the time the anastomosis is carried out overlapping of the mesenteries assures adequate circulation to the site of anastomosis. However the oblique end-to-end type of anastomosis when performed in selected cases by more experienced and adept surgeons readily restores physiologic continuity to the intestine without the delay for readjustment that is often encountered after other types of anastomoses have been performed.

Enterostomy. After removal of the necrotic portion of ileum and primary anastomosis had been performed drainage of the proximal loops of bowel by enterostomy tube was established in 7 cases with 5 deaths (71.4 per cent). Necropsy carried out in 4 cases demonstrated that in each case the enterostomy tube had been inserted about 10 to 15 centimeters proximal to the site of anastomosis. In 2 cases necrosis and sloughing of the wall of the bowel around the tube had resulted with leakage of much foul fluid into the peritoneal cavity. In another instance the ileum was obstructed completely at the site of the enterostomy.

In 7 cases in which the strangulated portion of bowel was doubtfully viable but was not removed enterostomy drainage was instituted

and there were 5 deaths (71.4 per cent). Of 14 cases in which enterostomy drainage had been established necropsy in 10 revealed necrosis of that portion of bowel around the tube and leakage of foul fluid into the peritoneal cavity in nearly all cases. In 2 cases marked constriction about the enterostomy tube had caused partial intestinal obstruction.

On the basis of the foregoing facts it might be concluded that in cases of strangulated femoral hernia with inextensive intestinal obstruction the establishment of drainage by enterostomy tube in the proximal portion of distended bowel greatly increases the operative risks. With ample consideration of the inherent dangers concomitant to the establishment of enterostomy drainage, increased efforts should be directed toward decompression of distention of the small bowel by other means. The use of Wangensteen's nasal suction apparatus or some modification such as the Miller Abbott or Wilson Sawyer double lumen tubes for continuous drainage of the small bowel from the moment intestinal obstruction or distention is recognized should obviate any need for enterostomy.

Exteriorization. The strangulated and gangrenous loop of ileum was exteriorized and secondarily removed in 2 cases with 1 death.

The necrotic loop of small intestine was exteriorized but not removed in 2 cases both patients succumbed. One patient died of diffuse peritonitis incident to replacement of the exteriorized loop into the abdomen 10 days after the first operation.

If the exteriorized nonviable loop of bowel is not removed primarily the source of proteolytic toxins formed from necrotizing tissues remains so that fatality may result from the toxemia alone. Although a primary removal of nonviable portions of strangulated bowel followed by anastomosis is the preferred surgical treatment, exteriorization and immediate removal of the strangulated loop is an alternative procedure when further surgical treatment is contraindicated. The risk of removal of the exteriorized loop of bowel is considerably less than that incident to replacement of the loop within the abdomen.

Invagination. There were 16 cases of Richter's hernia in which only a portion of the wall

of the small bowel was constricted within the femoral ring. In 5 of these cases the strangulated portion was invaginated into the lumen of the bowel. There were 4 deaths in these 5 cases (80 per cent). Several inverting Lembert sutures (Summers' stitch) were placed in the seromuscular layers of the adjacent normal portion of bowel so that the serosal layers were approximated over the inverted necrotic portion.

Necropsy showed definite constriction and intestinal obstruction at the site of inversion in 3 instances. Extensive necrosis of bowel and mesentery above and below the inverted segment with perforation and leakage at the site of inversion was found in the fourth case of the aforementioned five.

On the basis of these observations, it would seem that simple inversion of a small necrotic portion of the wall of the bowel is a procedure of questionable value in the surgical management of strangulated femoral hernia. When a nonviable segment is revealed the results indicate that it is advisable to take the extra time necessary to perform primary resection and anastomosis, rather than to invert the strangulated segment of bowel and thereby produce more obstruction.

When abdominal or pelvic viscera other than portions of the small intestine had been strangulated in the hernial sac the surgical management was directed primarily toward release of strangulation and reduction of the contents of the sac. Radical resection was unnecessary and thus the greatly diminished operative risk in these cases is reflected in the low fatality rate of 2.5 per cent.

TREATMENT OF THE HERNIAL SAC

When the contents of the hernial sac had been reduced and treated the sac itself was treated. In the majority of cases and especially when a portion of the small intestine had been strangulated the hernial sac was damaged to a lesser degree than its contents. However the sac was congested and edematous in nearly all cases and this increased the difficulties of its surgical management.

In 77 cases the hernial sac was closed at the neck by either a pursestring suture or simple ligature. It was then excised. When the in-

guinal approach was used the stump of the sac was often transfixed under the conjoint tendon. In 8 cases the stump was simply inverted as is done in the treatment of the sac of a direct inguinal hernia. When the sac was ligated and excised from below the inguinal ligament the neck was freed from the femoral ring and the stump was allowed to retract upward under the transversalis fascia.

In this series, the method of closure of the hernial sac apparently had little effect on the success of the operation although a femoral hernia recurred in 2 instances in which the sac had been ligated from below the inguinal ligament. It would seem that high ligation of the hernial sac with fixation of the stump under the conjoint tendon offers ample insurance against subsequent femoral or direct inguinal herniation.

REPAIR OF THE HERNIA

The basic methods employed for surgical repair of the femoral hernia depended on the anatomic approach either from above or below the inguinal ligament. More than 60 different operations have been enumerated for repair of a femoral hernia. Many plastic operations for filling the femoral canal by muscular peritoneal omental and heteroplastic flaps, are wrong in principle and have obtained little support whereas the simpler operations for obliteration of the femoral canal and closure of the femoral ring have prevailed.

The femoral hernia was repaired in 80 cases of the series of 104 but often the methods used were not specified. In 24 cases in which the surgical risk was excessive, the release of strangulation and treatment of the contents of the sac were more important than the method of repair of the hernia.

In 4 cases in which strangulation was treated through a femoral approach below the inguinal ligament the femoral ring and femoral canal were not repaired surgically, an action which was in accord with the procedure recommended by Ochsner in 1906. It was assumed that after reduction of the femoral hernia and ligation of the sac the femoral vein would re-expand gradually to come into contact with Gimbernat's ligament thus obliterating the femoral canal. When this method

was used however femoral hernia recurred in 2 cases

Repair of the femoral hernia was performed from below the inguinal ligament in 15 cases. In 7 closure of the femoral ring and canal was achieved by a single Coley stitch in which a pursestring suture of chromicized catgut was placed to approximate the inguinal ligament medial wall of the femoral vein pectineus muscle and fascia and Gimbernat's ligament. In the other cases, the pectineus muscle and fascia and the lower edge of Gimbernat's ligament were approximated to the inguinal ligament with the use of one to four chromicized catgut mattress sutures. The surgeon avoided the infliction of trauma to the femoral vein by retracting it with his index finger while the sutures were being placed. This procedure obliterates the femoral ring and canal without constriction of the femoral vein.

After reduction and treatment of strangulation had been carried out the femoral hernia was repaired from above the inguinal ligament in 65 cases. One of the following procedures was employed in each case.

Simple closure Simple closure of the femoral ring included the use of a pursestring suture to approximate the inguinal ligament medial wall of the femoral vein Cooper's ligament and Gimbernat's ligament. One recurrence followed this type of hernial repair.

Moschcowitz type of operation In the performance of this operation the inguinal ligament was sutured to Cooper's ligament.

Lothessen's or some modification of Annandale's original inguinal operation In the performance of this operation the conjoined tendon the mobilized rectus sheath external oblique aponeurosis or the transversalis fascia was sutured to Cooper's ligament. This placed a firm musculofascial barrier over the femoral opening to inhibit any subsequent femoral or direct inguinal herniation. The ultimate success of this operation depended on sound healing of the apposed structures, which often were out of alignment or were sutured under tension.

When the inguinal approach was used the operation usually was concluded with surgical repair of the inguinal canal. If the internal inguinal ring was enlarged or if there was

muscular relaxation in Heesselbach's triangle then the spermatic cord (round ligament in females) was transplanted subcutaneously and the external oblique aponeurotic flaps were imbricated beneath it.

SEQUELAE

In the 80 cases in which the femoral hernia was repaired there have been 3 known recurrences (a rate of 3.8 per cent). In addition direct or indirect inguinal hernias have developed on the same side in 3 patients. In each of the latter cases the femoral hernia had been repaired from below the inguinal ligament. Perhaps if the inguinal operation had been done originally any relaxation of the internal inguinal ring or muscular weakness of the inguinal canal might have been recognized and repaired then.

COMMENT

Many of the problems presented by a strangulated femoral hernia have persisted in spite of previous studies. Just what constitutes 'proper surgical management' of a strangulated femoral hernia is one of the problems the answer to which is dependent on the many circumstances of each case. No specific routines of management can be elaborated which will overcome effectively the many barriers and handicaps presented by any 2 cases of strangulated femoral hernia.

In the management of acute strangulation the surgeon's ingenuity frequently is challenged by the confusing and changing circumstances enveloping each case. Even for experienced surgeons the best judgment and technical skill often prove faulty and inadequate. But with reliance on the acquired knowledge of the anatomic physiologic and pathologic elements involved in strangulation the obstacles may be removed one by one and the operative results should be gratifying.

Some of the conflicting and confusing circumstances concerning the surgical management of strangulated femoral hernia have been presented and discussed in this paper. The authors hope that the observations and conclusions will be helpful to other surgeons who may be confronted with this condition at the operating table.

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SUMMARY AND CONCLUSIONS

A comprehensive review of the problems presented in 104 cases of strangulated femoral hernia has been made by one of the authors (Jarboe). It has been demonstrated that the surgical management is dependent on and determined by the clinical and pathologic conditions in each case. The most commonly used operative procedures have been appraised and evaluated. The responsibility for the unfavorable results often encountered has been attributed to the respective causative factors when possible.

From this study of the surgical management in 104 cases of strangulated femoral hernia a number of observations and conclusions may be derived.

First acute strangulation of a femoral hernia is a serious surgical emergency condition in which the time element is an important factor affecting the surgical management and ultimate prognosis.

Second a tense painful mass in the groin especially when it is associated with clinical evidence of acute intestinal obstruction must be considered a strangulated femoral hernia until proved otherwise by operation.

Third the inguinal operation for strangulated femoral hernia is recommended.

Fourth primary removal which is followed by anastomosis is advocated when a segment of small intestine is strangulated and nonviable.

Fifth when the viability of a strangulated viscus is questionable the risk of removal of the involved part is less than the risk of replacement of nonviable structures in the abdomen.

Sixth extirpation and the immediate removal of the necrotic portions of bowel are alternative procedures in those cases in which additional surgical treatment is contraindicated.

Seventh the inguinal operation with repair of the femoral and inguinal canals, offers the best insurance against recurrent femoral or inguinal herniation.

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THE MECHANISM OF PRODUCTION OF LINEAR SKULL FRACTURE

Further Studies on Deformation of the Skull by the "Stresscoat" Technique

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Detroit, Michigan

THE application of the stresscoat technique for the determination of strains following blows upon the skull has been described previously (1). The path and pattern of strains on the external surface of the skull following blows of known energy were studied and have been reported upon (2, 3). In the present contribution the strain paths on the external and internal surfaces of the skull have been studied simultaneously. The configuration of strain patterns on the internal surface of the skull are most revealing and help to formulate a more complete view of the mechanism of linear fracture from general deformation of the skull in head injury.

PROCEDURE

Fresh cadaver skulls were obtained from the anatomical laboratory of Wayne University, College of Medicine. The skulls were boiled for several hours to facilitate the removal of skin, muscles, dura, etc. The dura usually could be pulled loose and removed in several large pieces by working with long forceps through the foramen magnum. After drying for several hours the skulls were washed thoroughly with ether.

The skulls were now coated inside and out with a thin coat of aluminum lacquer which gives a uniform background for the stresscoat. After a drying period of 15 to 20 minutes, the skulls were sprayed with the stresscoat. A lacquer was chosen which had a strain sensitivity of 0.0005 to 0.0010 inch per inch for the prevailing temperature and humidity

conditions. Spraying of the interior of the skull was accomplished by means of an 8 inch extension rod attached to the spray gun. The extension was inserted through the foramen magnum. This method was found to be the best of several tried to coat the interior of the skull. Another method consisted of mounting the skull on a turntable and rotating it at a constant rate while directing the spray over the internal surface. However, it was found that the best results were obtained by manipulating the skull in one hand and directing the spray at the same time with the other. With a little practice it was possible to obtain a coating of a reasonably uniform thickness over practically all of the internal surface. Several calibrating strips used to determine lacquer sensitivity were run with each test.

The lacquer was permitted to dry for 24 hours before testing. The skulls were suspended above a polished steel block weighing several hundred pounds by means of a silk thread. The thread was tied around the skull in such a manner that when the skull was dropped it hit the steel slab so that the center of gravity of the skull was vertically above the point struck. Also care was taken to see that the blow was delivered normal to the surface being struck. The weight of the skull and the distance through which it was dropped determine the amount of energy absorbed. These experiments were carried out with a constant energy of 16 inch pounds. After hitting the steel surface the skull was caught on the rebound to prevent damage to the lacquer from secondary bounces.

The skull was now sawed in two by means of an electric circular bone saw. The bisection was carried out in such a way that it would not

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Fig 2 A frontal blow to the left of the midline. On the external surface of the skull are seen cracks in the lacquer extending downward toward the nose and the roof of the orbit to the right of the midline. On the internal surface of the skull there is a series of cracks in the lacquer forming a star with some cracks crossing the midline and extending downward toward the anterior fossa.

dropped and the sensitivity of the lacquer are given. Deceleration blows were studied in the following positions (1) frontonasal junction at the midline (2) midfrontal (3) frontal region lateral to the midline (4) lateral frontal (5) midline anterior interparietal (6) temporo-parietal (7) lateral parietal (8) midline posterior interparietal (9) lambdoid suture neighborhood halfway between midline and mastoid and (10) midline occipital. In some locations more than one skull was used. The resultant patterns are briefly described and can also be seen in the accompanying figures.

Frontonasal blow at the midline. Following a blow at the frontonasal junction at the midline the area of contact was butterfly shaped and it involved the frontal bone on both sides of the midline just above the orbits. On the internal surface of the skull, an irregular star pattern was noted somewhat disjointed by the midline frontal buttress. On the external surface there were some cracks in the lacquer surrounding the area of impact and others extending into the roof of the orbit on both sides. On more than one occasion such a blow was associated with contrecoup cracks in the lacquer at the base of the skull near the foramen magnum. These cracks traversed the

occipital bone in the anteroposterior direction (Fig 1)

Midfrontal blow. After a midfrontal blow on the external surface of the skull there were cracks in the lacquer extending toward the roof of the orbit on one or both sides with some cracks along both frontosphenoid junctions. In Figure 2 a midline frontal blow is characterized by a star pattern on the internal surface with cracks in the lacquer extending across the forehead to the roof of the orbit on the external surface of the skull. The external cracks begin as the internal pattern ends. In Figure 16 a midfrontal blow near the bregma is represented with the internal pattern in red and the external cracks in black. There is an outbending of the skull peripheral to the area of mbending in the region of impact. The outbending occurs in at least two planes in the right forehead in the superoinferior plane, and in the left forehead the outbending is obliquely from side to side.

Frontal blow lateral to the midline. On the interior of the skull a star shaped series of cracks in the lacquer are noted. On the exterior of the skull there are cracks in the lacquer extending toward the roof of the orbit and the lateral frontal region. The external



Fig. A midfrontal blow at the occiput. In the upper left cracks are seen in the lacquer surrounding the area of impact and extending across the midline. The ones inferior to the area of impact further extend to the medial and superior wall of the orbit on both sides. This is better seen in the upper right. In the lower left, starlike pattern is noted on the internal surface of the skull. This pattern is definitely interrupted by the midfrontal buttress. In the lower right cracks are seen in the lacquer covering the squamous portion of the occipital bone and extending toward the foramen magnum. These may be considered concentric type.

interfere with the deformation patterns obtained. The sawing itself did not produce cracking of the lacquer in any case.

The deformation patterns were next developed with red dye etchant applied for about 40 seconds and then removed with the etchant emulsifier. The dye penetrated any cracks

that formed as a result of the blow. They were traced with India ink and photographed.

MATERIAL

In Table I the number of the experiment, the location of the blow, the weight of the skull, the distance through which it was

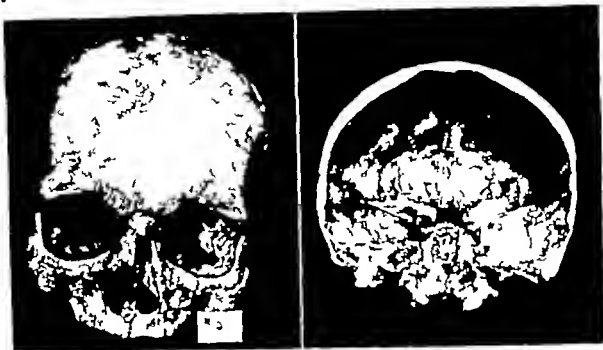


Fig. 2. A frontal blow to the left of the midline. On the external surface of the skull are seen cracks in the lacquer extending downward toward the nose and the roof of the orbit to the right of the midline. On the internal surface of the skull there is a series of cracks in the lacquer forming a star with some cracks crossing the midline and extending downward toward the anterior fossa.

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Frontal blow lateral to the midline. On the interior of the skull a star-shaped series of cracks in the lacquer are noted. On the exterior of the skull there are cracks in the lacquer extending toward the roof of the orbit and the lateral frontal region. The external

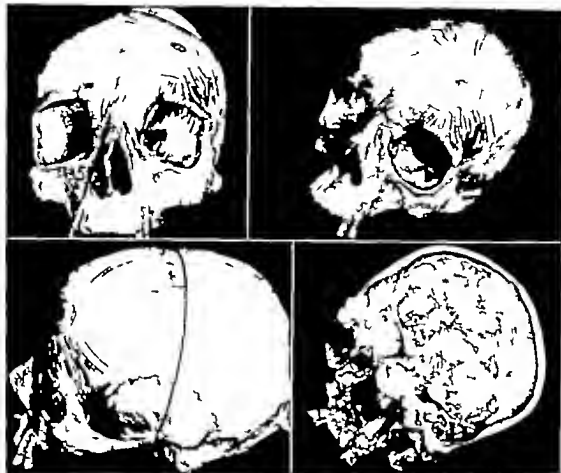


Fig. 3. Left frontal blow. In the upper left photograph, cracks can be seen in the lacquer extending downward toward the roof of the orbit and continuing on along the superior wall of the orbit. Most of these occur on the left side. A few cracks are also seen in the frontonasal junction. These also extend toward the roof of the orbit. In the upper right photograph the pattern surrounding the area is better seen with some cracks also noted superiorly and medially. In the lower left, the lateral view of the skull on the left side discloses the strain patterns extending downward and posteriorly toward the temporal bone. There are also some cracks in the lacquer in the sphenotemporal bone just above the zygomatic arch. In the lower right, the internal surface of the skull shows a star pattern with cracks extending for longer distances medially than laterally. This arrangement can be explained by virtue of the fact that the radius of curvature laterally changes much more abruptly than medial to the star pattern.

cracks appear at a point where the cracks on the internal surface end. A frontal blow lateral to the midline involved mainly the orbit on the same side but a few cracks were found crossing the nasion to the opposite side (Fig. 3).

Lateral frontal blow. On the internal surface a well formed star more extensive in the anteroposterior direction than from above downward is noted. On the external surface a series of cracks extend down toward the temple and a few also involve the zygomatic arch. Again the external cracks begin just where the internal cracks end (Fig. 4). In Figure 17 a

composite representation of the internal and external patterns is given. The red colored lines represent the internal pattern and the black lines are those found on the external surface of the skull. Note that the black lines begin where the red lines have just ended. An unbending about the area of impact and an unbending in the anterior temple producing strains in the anteroposterior direction can be noted.

Midline anterior interparietal blow. Following a midline anterior interparietal blow the skull showed a star shaped series of cracks on

TABLE I.—SUMMARY OF EXPERIMENTS

Skull No.	Weight lbs.	Distance dropped inch	Lacquer sensitivity lock per inch	Location of blow
	1.28	3½	00 00	Right posterior parietal
	.22	4½	0005	Midline occipital
3	.76	0¼	0005	Midline frontal
4*	.46	6½	0005	Posterior Interparietal
5	1.44	3½	00 05	Left frontal
6	.13	5	0005	Anterior Interparietal
7	1.70	9¾	0005	Right occipital
8	.87	8¾	0005	Midline occipital
9	.60		00 05	Midline frontonasal junction
	.09	7 ½	00105	Left parieto-occipital (lambda suture neighborhood)
	.80	8½	0005	Midline frontal
13		7½	00105	Right temporal
14	.70	9¾	00 05	Midline frontonasal junction
5	2.3	7¾	0.00105	Midline occipital
6	.65	9¾	00 00	Right mastoid
7	.70	9¾	00000	Right parietal
8	.58	3½	00105	Midline frontonasal junction
9	1.40	6	00105	Right temporal
10	.7	9½	00105	Posterior Interparietal
	.99	6¼	00100	Right occipitoparietal (lambda suture neighborhood)
	1.36	3½	0.00 00	Right lateral frontal
1	.9	8½	00 00	Midline frontal
11	.85	8½	00105	Right parietal
5	.38	1¼	00 05	Right lateral frontal

*Skull too thick, no star pattern obtained.

its internal surface somewhat more extensive anteriorly and longer in the left lateral direction. This was associated with cracks in the lacquer appearing on the external surface of the skull in such a manner that the external cracks dovetail with the internal ones. The most prominent external cracks are those extending perpendicularly downward toward the temple on both sides (Fig 5). In Figure 18 the internal (red) and the external (black) patterns are reprinted together. Note that the region about the point of impact is indented in an asymmetrical manner. This is in turn surrounded by an outbending of the skull with strains on the anteroposterior direction in the parietotemporal neighborhood and from side to side posterior to area of indention.

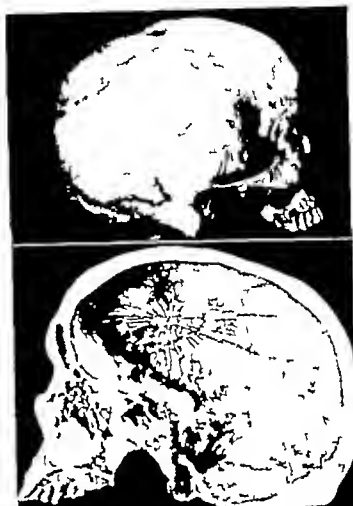


Fig. 4. A lateral frontal blow left frontal parietal junction. In the upper photograph cracks in the lacquer downward toward the temple are seen and a few cracks are also seen on the zygomatic bone and arch arranged radially. On the internal surface, in the lower photograph, a star pattern is again noted. This star is much more extensive anteroposteriorly than superoinferiorly. In Figure 17 when the patterns on the internal and external surface of the skull are superimposed, it becomes apparent that the external patterns appear at the border of the internal patterns.

Temporoparietal blow On the internal surface the usual star with fairly long extensions anteriorly and fairly limited propagation superoinferiorly is noted. This region is surrounded on the outside of the skull with cracks in the lacquer extending downward and forward toward the temple others extending posteriorly toward the midline and still others superiorly toward the midline. Corresponding to the border of the star pattern on the internal surface of the skull there are circular lines on the external surface. Some cracks in the lacquer at the base on the same side are also seen (Fig 6).

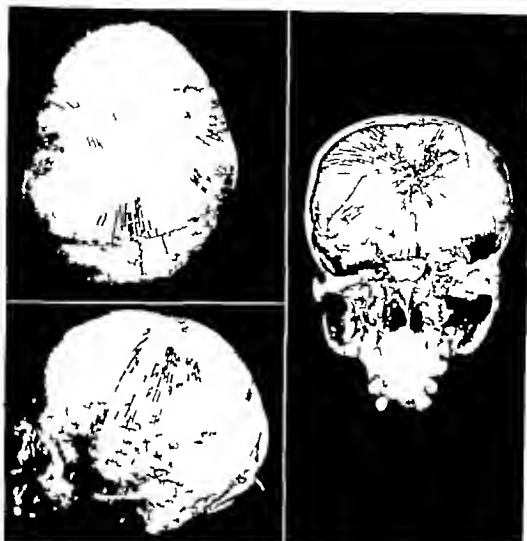


Fig. 5. Anteroparietal blow at the midline near the frontoparietal junction (bregma). The upper left photograph shows the strain pattern on the superior surface of the skull. Several discreet groups of cracks are seen extending laterally and downward. Another group extends posteriorly to the midline. In the lower left figure the cracks appearing on the lateral surface of the skull are seen coursing toward the temple on the left. The same configuration is noted on the right side. On the anterior of the skull seen in the photograph to the right, star pattern is again noted with more marked propagation along the anterior midline and laterally on either side, with rather abrupt stoppage of the pattern posteriorly to the midline. On careful superimposition, and as seen in Figure 8, the pattern on the internal surface of the skull fits in between the group of cracks in the lacquer seen on the external surface of the skull.

Lateral parietal blow In one specimen only a star on the internal surface of the skull was noted with no pattern on the outside except for a few cracks on the anterior temporal region. It should be noted that this is a rather thick skull (Fig. 7). Again the anteroposterior dimensions of the star are much more extensive than the superoinferior. In Figure 8 a series of cracks appear on the external surface

of the skull suggesting a strain anteroposteriorly in front superoinferiorly in the temporal bone and anteroposteriorly in the posterior inferior parietal region. Note that the strains in the posterior inferior parietal region are about at right angles to the strains occurring in the anterior parietal region near the temporal bone. On the internal surface the star pattern dovetails with the exter-

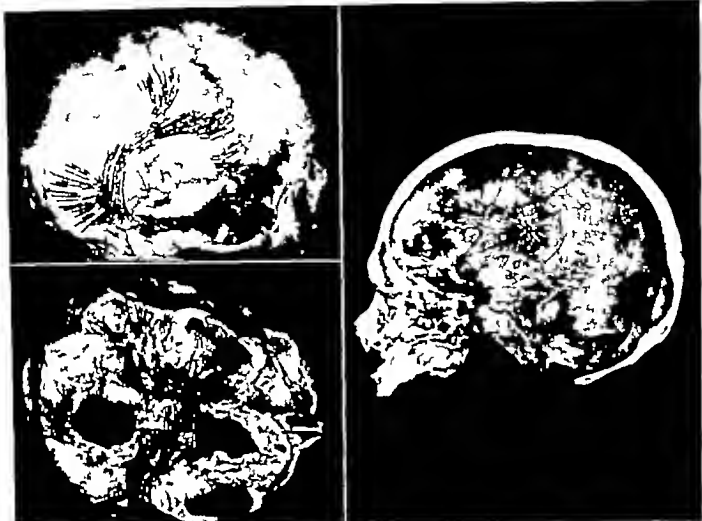


Fig. 6. Temporoparietal blow on the right side. In the upper left there is an area of lacquer surrounding the impact which is devoid of cracks. This is in turn surrounded by circular cracks which extend downward and forward in the anterior and inferior portions, upward and forward superiorly downward and backward posteriorly.

nal pattern. In Figure 9 an irregular star is seen on the internal surface with cracks in the lacquer extending downward and forward on the external surface. In this specimen there is also a contrecoup deformation of the left lateral frontal region with cracks appearing only on the external surface suggesting an outbending of the skull in this region. In Figure 10, the pattern following a posterior parietal blow near the midline is shown. On the external surface of the skull a few cracks extending downward and forward are seen. On the internal surface a well formed star pattern is shown. The external cracks begin where the lines of the internal pattern end.

Midline posterior interparietal blow. On the external surface no patterns are noted but on

In the lower left, there are some cracks at the base of the skull as far as the basilar portion of the occipital bone. In the photograph to the right the internal surface of the skull shows a star formation with the cracks extending anteriorly for longer distances than superoinferiorly.

the internal surface a star pattern is seen (Fig 11).

Blow on lambdoid suture neighborhood half way between midline and mastoid. In Figure 12 the pattern of a posterior parietal blow near the lambdoid suture is shown. On the external surface of the skull cracks in the lacquer extend down toward the base and the mastoid region. A few cracks appear in the anterior temporal region near the frontozygomatic junction on both sides. On the internal surface a star pattern is noted. The external lines in the lacquer begin where the cracks of the internal star pattern end. In Figure 13 an extensive star is noted on the internal surface of the skull again showing greater length in the anteroposterior direction than superoin-

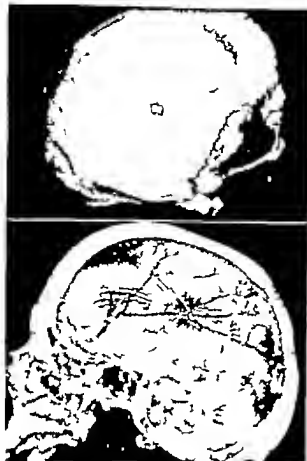


Fig. 7 Right lateral parietal blow. This thick skull shows no cracks of the lacquer on its external surface. On the internal surface of the skull, in the lower photograph, the usual star is again seen, with anterior extensions much more widespread than superolaterally.

teriorly. On the external surface cracks appear in the lacquer extending toward the base of the skull on the right side, lateral to the foramen magnum.

Midline occipital blow near lambdoid suture
In Figure 14 the blow was somewhat to the right of the midline with a beautiful star pattern on the internal surface of the skull limited on the medial and inferior portions by the midline occipital buttress. On the external surface of the skull there are some cracks extending toward the mastoid and others extending toward the foramen magnum. In Figure 15 a nice pattern is noted on the internal surface with irregularity in contour and this pattern fits almost exactly the area of the skull on the external surface not showing any



Fig. 8 Right lateral parietal blow. On the external surface the point of impact is surrounded by an area devoid of cracks of the lacquer. This corresponds to the star pattern on the internal surface of the skull. Outbending strains are at least in three directions. Forward they are obliquely in the superolateral direction, below they are in the superior inferior direction and behind, in the anterior posterior direction. The lateral pattern is cut short superiorly due to the curving of the skull.

cracks in the lacquer. The point of impact is surrounded by masses of cracks anteriorly laterally and posteriorly in such a manner as to suggest a most interesting pattern of deformation of an undulating type governed in part by buttresses and variations in thickness. In Figure 19 the red lines represent the internal pattern and the black lines the external cracks in the lacquer. Note the way the internal and external patterns dovetail.



Fig. 9. Right posterior parietal blow. This set of photographs is included in order to emphasize the contrecoup pattern seen in the skull to the right. The cracks in the lacquer appeared only on the external surface of the skull and they occur just superior and posterior to the zygomaticofrontal junction. The upper photograph to the left

shows a pattern on the internal surface of the skull of an irregular star with anterior extensions several times longer than the cracks superoinferiorly. In the lower left, there is extensive deformation pattern evidenced by cracks in the lacquer extending downward and forward.

DISCUSSION

It should be re-emphasized that this method shows only tensile strain patterns (tearing apart). Compression strains (pushing together) cannot be visualized in these studies. However, when both external and internal surfaces of the skull are available for study bending activity can be determined. Bending produces tension on one surface and compression on the other. Thus in a region where cracks are found on one surface of the skull and not on the other bending has occurred as indi-

cated by the position of the cracks. Cracks on the external surface of the skull indicate outbending while cracks on the internal surface indicate a region of inbending.

Following a deceleration impact there is an area of inbending the limits of which are governed by the radius of curvature of the skull in the region of impact. At times this area of inbending is of irregular outline due to irregularities of thickness, presence of buttresses and other factors such as emissary foramina and diploic channels of unusual ex-

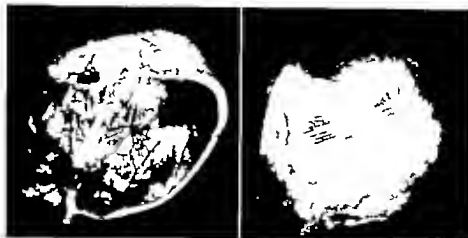


Fig. 6. Posterior parietal blow. On the external surface, there are cracks extending downwards and forwards toward the temple. On the internal surface, a beautiful star pattern is seen. The external cracks begin where the internal cracks end.

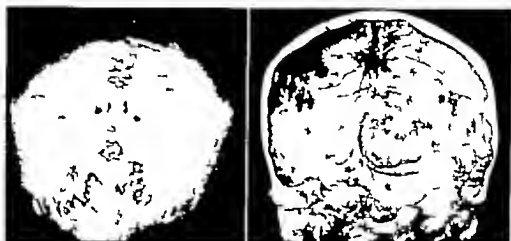


Fig. 7. An interparietal blow at the midline near the lambdoid suture. The left photograph shows no pattern on the external surface of the skull. The right photograph shows a star pattern on the internal surface of the skull somewhat interrupted by the midline buttress.

tent. Peripheral to the area of inbending the bone bends out simultaneously in certain selected areas and this occurs in the same and other specimens in repeated tests. The pattern suggests undulating type of movement with simultaneous inbending in the region of impact and outbending beginning at the border of the area of inbending. In Figure 17 the red lines are those of the internal pattern and the black lines constitute the patterns seen on the external surface of the skull. It is apparent that unbending takes place in the region of the red lines while outbending occurs in the area of black lines. The undulating character

istics of the deformation pattern thus can be visualized. In Figure 19 note that the inbending or red line pattern is of irregular outline, suggesting an asymmetrical area of inbending peripheral to which discrete areas of outbending can be seen. The strain is anteroposteriorward in the parieto-occipital areas of both sides, from side to side anterior to the area of impact and in the squamous portion of the occipital bone. Thus, the outbending of the skull may be in different planes in various regions after a single impact. This is in part governed by buttresses, contiguous thick and thin areas of bone and the shape of the injuring object.

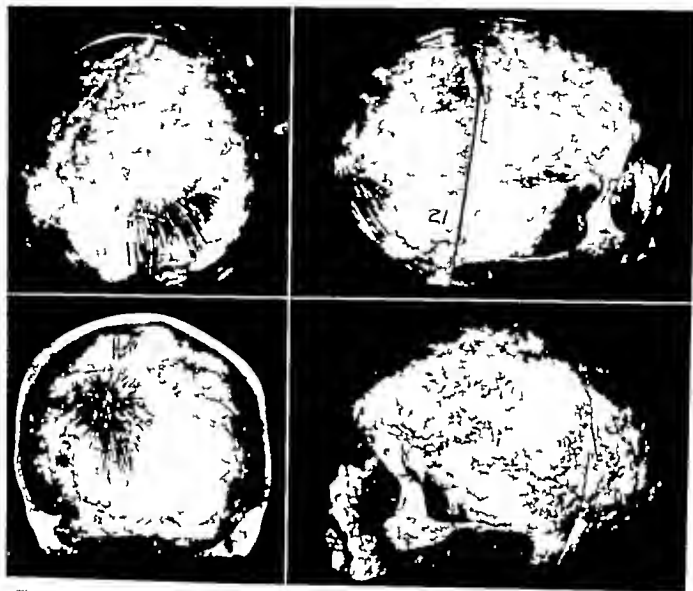


Fig. 12. Posterior parietal blow near the lambdoid suture. In the upper left, cracks extend laterally and toward the base. In the lower left, the internal pattern is shown. Again

the external pattern begins where the internal pattern ends. The right upper and lower photographs show some cracks in the lacquer near the frontozygomatic junction on both sides.

In deceleration blows the pattern seen on the internal surface of the skull is of the same type in almost every instance. One sees a star with cracks in the lacquer arranged radially and extending away from the area of impact. In general, the cracks in the star extend farther posteriorly and anteriorly than superiorly and inferiorly since the radius of curvature in the first instance is much greater and the skull is found to curve much more rapidly in the superior inferior direction. The star pattern suggests an inbending with strains most concentrated in the region of impact. It appears from the pattern and the type of deformation that shear forces act between the two layers

of the skull and may cause a sliding action between the outer and the inner table. If the blow is sufficiently severe and localized an area of actual depression may occur and as the bone fails resulting in depression a tearing apart of the inner and outer tables of the skull may take place. In some cases with depression fragmentation of the bone in the area of deformed bone may be governed by the inbending pattern seen on the internal surface of the skull.

The internal pattern does not disclose a characteristic path of strain in any given direction it rather points to the fact that due to the inbending of bone the strain extends

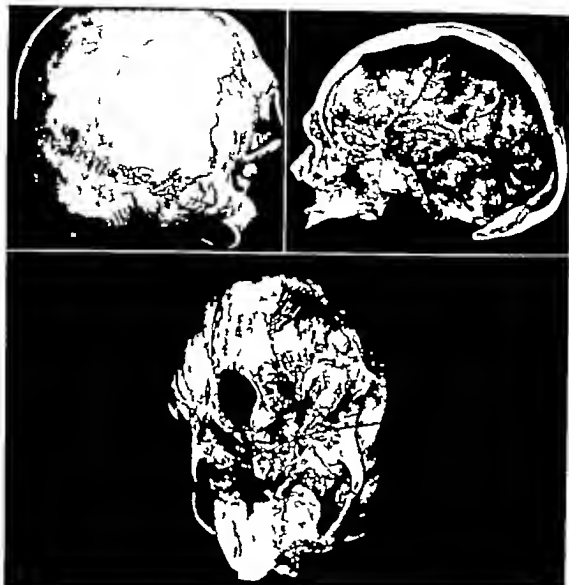


Fig. 3. Parieto-occipital blow midway between midline and mastoid and on the lambdoid suture. The upper left shows series of cracks extending down toward the base of the skull also seen in the lower photograph. The cracks divide into one group curving medially and another extending forward toward the base. Still other cracks are noted just lateral to the occipital process of the occipital bone. In the upper right photograph, the pattern seen on the internal surface of the skull is shown.

radially from the point of impact only limited by the radius of curvature and peculiar structural characteristics of the skull. In blows not severe enough or sufficiently localized to cause depression or perforation the production of a linear fracture is governed by strains seen on the external surface of the skull. This suggests initiation of the fracture line away from the point of impact. After the crack forms it propagates in both directions, toward

and away from the area of the blow. Its extension toward the area of the center of the impact can be explained by the fact that although the area of indenting on the outer surface of the skull is initially in compression as the bone rebounds tensile strains appear with the maximum values at the center. The propagation of the fracture line to this region of tensile strains is to be expected. The fracture reaches the center and usually does not extend further

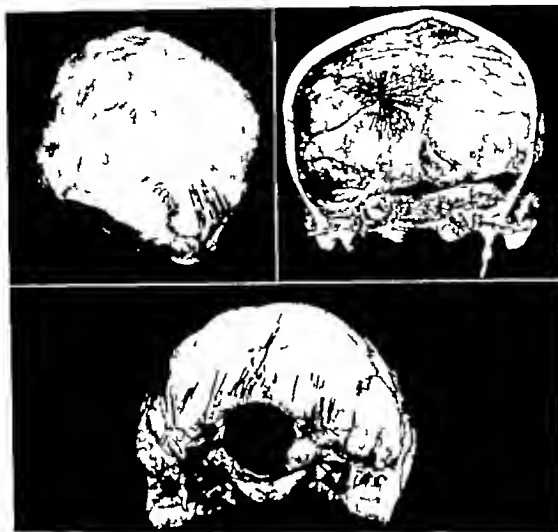


Fig. 14. Right occipitoparietal blow 3 inches from the midline and just superior to the lambdoid suture. In the upper left photograph, cracks are seen extending down toward the mastoid bone. In the upper right, a typical star pattern is noted. Superimposition of the internal and external group of cracks makes it evident that the external group start as the internal group end. In the lower figure there are several cracks extending toward the foramen magnum and a few crossing the midline obliquely.

because the tensile strain gradient decreases rapidly from the center outward. In certain positions two lines of fracture may begin on either side of the skull uniting at the point of impact. It is difficult to explain the genesis of linear fracture from the internal star pattern since the propagation of the fracture line would extend in both directions from the center of the area of impact in every case and reach as far as the border of the area of inbending. In some of the specimens studied a linear fracture did occur. This line frequently extended to the area of impact and in no instance was the line seen crossing the region of the blow. If the internal pattern were significant relative to the causation of linear frac-

tures such a separation of bone should have been seen crossing the area of impact and limited to the pattern on the internal surface of the skull. It should be pointed out that the two-layer characteristic of the skull through the greater portion of the vertex suggests that in the inner table a greater degree of deformation without fracture can occur because it is much thinner than the outer table of the skull. It is of course admitted that shear forces occur between the two tables at impact.

Thus far blows with a hammer having a face of one inch in diameter and deceleration blows on a flat steel plate have been studied. With the hammer the area of contact is smaller hence a smaller area of inbending takes

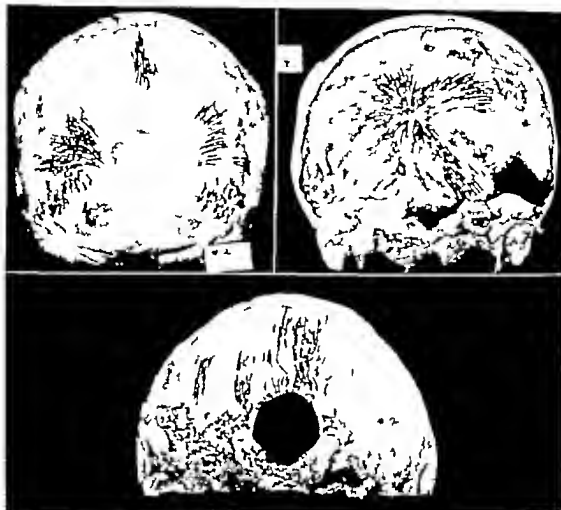


Fig. 5. Midline occipital blow at the lambdoid suture. 1 the upper left, three groups of cracks are noted, 1 laterally one anteriorly. On the internal surface of the skull, in the photograph 1 the upper right, is seen an irregular star which fits in the space between the external group of cracks. 1 the lower photograph, cracks 1 the lacquer extend toward the foramen magnum and lateral to the same (see Fig. 9)

place. With deceleration blows a larger area is contacted with a more extensive indending. However in both groups of experiments the general pattern of tensile strains is the same. More work is contemplated with blows on convex and concave surfaces.

The work with the "stresscoat" points to the following explanation of linear fracture. The area of impact is indented with simultaneous outbending of some of the surrounding area of bone. This outbending is selective and occurs more readily in some places than others. The pattern of cracks in the lacquer resulting from the outbending parallels most fracture lines seen clinically. The "stresscoat" work

suggests that many linear fractures are initiated at a distance from the point of impact extending toward the point of impact and in the opposite direction. Some fractures may appear on either side of the area of impact simultaneously and meet at the point of impact. Two fracture lines may be initiated in different parts of the skull and extend toward the area of impact.

It is recognized that in these studies blows are administered to a single area on the skull, whereas in ordinary deceleration injuries such as in automobile accidents, multiple blows may occur practically simultaneously changing the resultant patterns appreciably. How

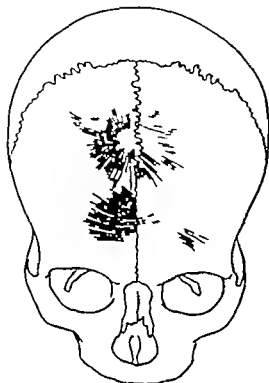


Fig. 6.

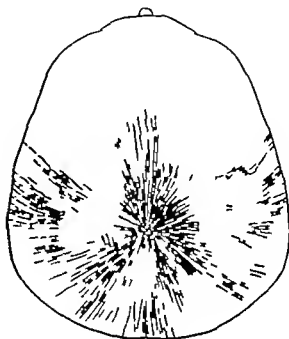


Fig. 18

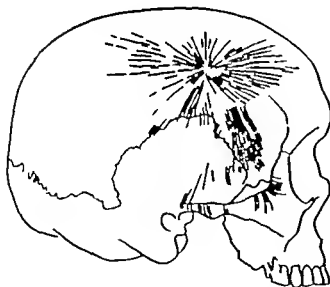


Fig. 17

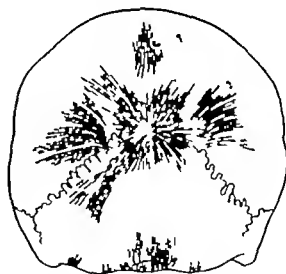


Fig. 19.

Fig. 16. Midfrontal blow with internal pattern shown in red and external pattern in black. Note that inbending about the point of impact is surrounded by an irregular outbending of the skull. The outbending is superoinferiorly in the right forehead region and obliquely superoinferiorly and about at right angles with the first described outbending in the left forehead region.

Fig. 17. The red lines indicate the internal and the black lines the external patterns after a lateral frontal blow, as seen in Figure 4. Note that the outbending of the skull is mainly in the anteroposterior direction. Note also that the internal pattern is more extensive in the anteroposterior direction due to the greater radius of curvature of the skull in this plane.

Fig. 18. Composite representation of internal and external patterns shown in Figure 5. The red, or the internal and the black, or the external, cracks dovetail with each other. Note that after an asymmetrical inbending about the area of impact there are areas of outbending with strains anteroposteriorly on the lateral aspect and from side to side in the pattern posterior to the area of inbending.

Fig. 19. This is a composite representation of the internal and external patterns as seen in Figure 15. Note that the strain is from side to side in the anterior and basal group of black lines, and anteroposteriorly in the lateral group of black lines. Note the irregular bordered internal pattern of red lines that fit in the space left vacant between the outbending patterns on the external surface.

ever the effect of multiple blows can be visualized by the superimposition of patterns obtained from single blows.

CONCLUSIONS

1 Many linear fractures result from out bending of the skull and they are initiated away from the point of impact

2 Many linear fractures are initiated on the outer layer of the skull by tensile (tearing apart) strains.

3 From the position of the area of impact the direction of the resultant fracture line may be surmised

4 From the position of the fracture line the area of impact causing the injury may be surmised

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THE STABILITY OF THROMBIN, PENICILLIN OR STREPTOMYCIN, IN THE PRESENCE OF GELATIN SPONGE, OXIDIZED CELLULOSE OR EACH OTHER

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THERE is an increasing interest in the biologically absorbable matrices such as absorbable gelatin sponge (2) and oxidized cellulose (8 10) Potent concentrates of the blood clotting enzyme thrombin have been used in conjunction with these substances to enhance hemostasis That such surgical adjuncts might also be impregnated with certain of the antibiotics and implanted in wound areas to give desirable local or even prolonged systemic concentrations presents an intriguing possibility

Seegers and Doub have reported that thrombin is destroyed by oxidized cotton within a few minutes due to the acidic nature of the fibers when the cotton was treated with a solution of bicarbonate it lost its destructiveness to thrombin The purpose of this paper is to report investigations concerning the effect of gelatin sponge and oxidized cellulose on solutions of thrombin penicillin or streptomycin also data on the stability of thrombin and penicillin and thrombin and streptomycin when this enzyme is in solution with each antibiotic

THROMBIN IN THE PRESENCE OF GELATIN SPONGE (GELFOAM) OR OXIDIZED CELLULOSE

The bovine thrombin used was prepared in our laboratory essentially according to the method of Astrup and Darling Sufficient powdered thrombin was dissolved in 20 cubic centimeters of distilled water to yield a solution with an initial clotting potency of 500 units per cubic centimeter when assayed with pooled plasma (6) This original solution had a pH of 6.6

A 100 milligram gelatin pad was wet and mixed intimately with 10 cubic centimeters of the above thrombin solution the solution pH then measured 6.0 With the sponge in it the

aliquot was allowed to stand under laboratory conditions and was assayed at intervals for thrombin potency (Table I)

In a similar manner a 100 milligram piece of oxidized gauze was mixed with the remaining 10 cubic centimeters of thrombin solution (pH became 3.7) and intermittent assays for clotting potency obtained as indicated in Table I

The unneutralized oxidized gauze was immediately destructive to the enzyme activity this is in agreement with data previously reported (7) Gelatin sponges were found to have no effect on the thrombin concentration

PENICILLIN IN THE PRESENCE OF GELATIN SPONGE OR OXIDIZED CELLULOSE

For these investigations penicillin (calcium salt) was dissolved in a liter of distilled water to give a solution having 300 micrograms per cubic centimeter with a pH of 6.5 A 200 cubic centimeter aliquot of this was set aside as a control (solution A Table II) All solutions were held under laboratory conditions and penicillin determinations made at stated times by a chemical assay technique (3)

A pad of absorbable gelatin weighing approximately 1 gram was wetted and suspended in a 200 cubic centimeter volume of the mother

TABLE I — EFFECT OF GELATIN SPONGE AND OXIDIZED CELLULOSE ON THROMBIN POTENCY

Time	Gelatin sponge in thrombin solution (Units/c.c.)	Oxidized cellulose in thrombin solution (Units/c.c.)
Initial potency	500	500
5 minutes	500	< 100
10 minutes	500	—
15 minutes	—	—
1 hour	500	—
6 hours	500	—

From The Research Laboratories of The Upjohn Company

TABLE II.—EFFECT OF OELATIN SPONGE AND OXIDIZED CELLULOSE ON PENICILLIN POTENCY

Time	A	B	C	D
	Penicillin solution (control) penicillin (micrograms)	Gelatin sponge in penicillin solution penicillin (micrograms)	Oxidized cellulose in penicillin solution penicillin (micrograms)	Penicillin solution buffered to pH penicillin (micrograms)
Initial potency	300	300	300	300
1 hour	300	90		
3 hours	290			
7 hours	270			2

liquor (solution B Table II) pH of this solution became 6.2. Penicillin concentrations were ascertained and recorded (Table II).

To another 200 cubic centimeter portion was introduced a pad of oxidized gauze weighing approximately a gram (solution C Table II). The acidic nature of the gauze lowered the pH of the penicillin solution to 3.1.

Loss of thrombin activity in the presence of oxidized cellulose has been shown (7) to be due to the acidity which cellulosic acid imparts to the solution. With this in mind the final 200 cubic centimeter aliquot of the original penicillin solution was adjusted to a pH of 3.0 (solution D Table II) or to the same acidity as that of the oxidized gauze treated solution and penicillin activity followed.

Typical results for such studies are revealed in Table II. Gelatin sponges were relatively innocuous to the penicillin; there appears to be in the first 2 hours a loss of about 20 per cent of the antibiotic activity with very little subsequent loss throughout the experimental period. The oxidized cellulose destroyed nearly 90 per cent of the total penicillin, with 75 per cent being destroyed in the first 2 hours. Penicillin solutions that had been buffered to an acidity corresponding to that produced by the gauze demonstrated similar loss of potency. This would indicate that the deleterious action of the oxidized cellulose could be ascribed to its inherent acidity.

STREPTOMYCIN IN THE PRESENCE OF OELATIN SPONGE OR OXIDIZED CELLULOSE

For these studies distilled water solutions of streptomycin (sulfate) were so prepared

TABLE III.—EFFECT OF OELATIN SPONGE AND OXIDIZED CELLULOSE ON STREPTOMYCIN POTENCY

Time	A	B	C	D
	Streptomycin solution (control) streptomycin (micrograms)	Gelatin sponge in streptomycin solution streptomycin (micrograms)	Oxidized cellulose in streptomycin solution streptomycin (micrograms)	Streptomycin solution buffered to pH streptomycin (micrograms)
Initial potency	1,000	1,000	1,000	1,000
1 hour	10,700	1,000	10,000	10,000
3 hours	1,000	1,000	10,000	1,000
7 days	700	1,000	10,000	1,000

that each cubic centimeter contained about 11,000 micrograms of pure streptomycin base. All solutions were kept under laboratory conditions throughout the entire period of study. Streptomycin assays were made as described by the Food and Drug Administration (5).

As listed in Table III A was a water solution (pH = 5.5) of the drug only as a control. B (pH = 5.4) was 35 cubic centimeters of streptomycin solution to which a 200 milligram sponge of absorbable gelatin was added. C (pH = 2.6) was the same volume of streptomycin solution with a 200 milligram piece of oxidized cellulose in it. D was the antibiotic solution alone buffered to a pH of 3.0.

Streptomycin in solution was stable (Table III) under all the conditions to which it was subjected in these studies for as long as 10 days.

THROMBIN AND PENICILLIN ACTIVITIES WHEN THE TWO ARE IN MUTUAL SOLUTION

Thrombin is used clinically often in conjunction with an absorbable matrix to enhance or assure hemostasis. The desirability of using bacteriostatic substances in wound treatment suggested that perhaps when thrombin was employed to stay hemorrhage it would often be rational to put the clotting enzyme in solution with the bacteriostatic agent of choice to permit simultaneous application. Information was needed as to the compatibility of thrombin and such substances. The study presented here and the following one are the results of our experiences with two of the antibiotics.

TABLE IV—STABILITY OF THROMBIN AND PENICILLIN WHEN IN MUTUAL SOLUTION

Time	Thrombin (units/c.)	Penicillin (units/c.c.)
Initial potency	200	1,000
1 hour	200	60
1 hour	75	0.20
3 hours	50	0.60
7 hours	20	0.20

Thrombin and penicillin materials used were the same as identified in the previous studies as was also the technique for thrombin assay. Penicillin was determined by the cylinder plate method (4) with dilutions made in buffer of pH = 6.0.

A distilled water solution of penicillin was prepared to have a concentration of 1,000 Oxford units per cubic centimeter. Powdered thrombin was dissolved in this solution to give a clotting potency of 200 units per cubic centimeter. The mixture was held at room temperature and assayed as indicated (Table IV) for each constituent.

Within the errors of the assay techniques neither thrombin nor penicillin showed any loss of potency when in mutual water solution for over 7 hours.

THROMBIN AND STREPTOMYCIN ACTIVITIES WHEN THE TWO ARE IN MUTUAL SOLUTION

Experiments similar to those reported for penicillin have been carried out with streptomycin.

Streptomycin (sulfate) was dissolved in distilled water to a concentration of 11,000 micrograms per cubic centimeter. This solution was used to reconstitute powdered thrombin to a clotting potency of 500 units per cubic centimeter. The mixture was held at room

TABLE V—STABILITY OF THROMBIN AND STREPTOMYCIN WHEN IN MUTUAL SOLUTION

Time	Thrombin (units/c.c.)	Streptomycin (micrograms/c.c.)
Initial potency	500	1,000
1 hour	500	—
1 hour	500	0.350
3 hours	500	—
7 hours	500	—
7 hours	200	0.00

temperature and assayed for each entity by methods which have been mentioned (5, 6).

Both the thrombin and streptomycin (Table V) retained their initial potency when in solution with each other.

SUMMARY

The enzyme, thrombin and the antibiotic, penicillin were both rapidly destroyed by oxidized cellulose. This is apparently due to the lowering of the pH of such solutions by the gauze, for thrombin or penicillin were also unstable in solutions buffered to a pH corresponding to that produced by pieces of oxidized cellulose.

Thrombin or penicillin showed no loss of potency from solutions in which absorbable gelatin sponges were suspended. The gelatin sponges did not significantly alter the inherent pH of the solutions.

Streptomycin was stable in the presence of either gelatin sponge or oxidized cellulose.

When powdered thrombin concentrate (bovine) was reconstituted with an aqueous solution of penicillin or streptomycin all constituents were compatible as evidenced by no loss of enzymatic or antibiotic potency.

The possible combinations for studies of this type are numerous particularly as concerns the use of the absorbable matrices with aqueous solutions of various substances. Some of these are being investigated. Preliminary data indicate that ascorbic acid which has been reported (9) to be of interest in wound healing shows little deterioration in the presence of gelatin sponge or oxidized cellulose.

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SUBPERITONEAL HEMORRHAGE FROM VITAMIN C DEFICIENCY SIMULATING ACUTE SURGICAL ABDOMINAL CONDITIONS

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THE frequency of atypical and even asymptomatic vitamin deficiencies is now well established. Routine vitamin C administration in postoperative states is based on our knowledge that scurvy may exist with or without characteristic symptoms, physical signs or roentgenologic evidence. The typical symptoms attributed to classical scurvy are hemorrhages, anemia, swollen and bleeding gums and bone changes; however, these are not often encountered.

The diagnosis in the atypical or subclinical case is made by laboratory methods, signs of capillary fragility, and a careful analysis of food intake together with factors capable of inhibiting absorption, such as decreased utilization in hepatic disease, the increased secretion in lactation, the increased destruction by alkalis, and the increased requirements of metabolic disorders.¹

Hemorrhage is one of the most significant and characteristic features of scurvy. This may be obvious as seen in bleeding gums, purpuric lesions or hematuria. It may be less obvious if the bleeding is in the muscle, joint or internal viscous. In the cases here reported the hemorrhages were subperitoneal and the manifestations were similar to those of acute surgical abdominal diseases. In various surgical monographs little or no consideration is given to the possibility of surgical mistakes on this basis, although cases of cryptogenic spontaneous hemorrhage of the abdominal walls have been reported.

CASE 1. R.E.F., a 17 year old male whose previous health had been good, was admitted to St. Joseph Hospital, November 1, 1945, about 5 hours after having been kicked in the abdomen by a teammate during a high school football scrimmage. Momentarily

he was stunned by the injury and was excused from practice. Thirty minutes later he vomited, and pain in the epigastrium increased steadily until 3 hours later it was described as unbearable. Examination revealed marked tenderness and rigidity in the upper half of the abdomen. The temperature reading showed 99 degrees F. There were no findings in the chest or upper respiratory tract. A blood examination showed 15,000 leucocytes, 92 per cent polymorphonuclear hemoglobin 14.0 grams, and the erythrocyte count was 5,050,000. An x-ray examination of the abdomen revealed no free air or ladderling of the intestines.

A laparotomy was performed by Dr. Bertram Fitzgerald 6 hours after the onset because rupture of an abdominal viscus was suspected. When the peritoneum was opened there was no air or excessive fluid present. The liver and spleen were normal. When the common mesentery was exposed, an enormous number of ecchymotic and petechial hemorrhages covered almost the entire mesentery. A few were scattered over the anterior surfaces of the cecum, ileum, and jejunum. No additional pathology was discovered and, after all viscera had been inspected for perforation, the abdomen was closed.

Partial atelectasis of the right lung on the second postoperative day produced some dyspnea and slight fever (102 degrees F as the maximum) but otherwise ran an uneventful course.

On the day following surgery blood studies revealed prothrombin time 26 seconds (normal 21 seconds), clotting time 3 1/2 minutes, bleeding time, 1 to 2 minutes, platelet count about 300,000 per cubic millimeter, ascorbic acid level on whole blood plasma, 0.3 milligram.

A capillary fragility test with the blood pressure at 80 millimeters of mercury for 5 minutes showed numerous petechia. Further questioning revealed that the patient's diet was inadequate. He rarely ate raw fruit, vegetables, salads, or fruit juices. He ate considerable amount of sweet foods and moderate amounts of meat and milk.

The postoperative care consisted of an appropriate diet and 500 milligrams of ascorbic acid parenterally daily. At the end of 10 days he was discharged in good health with the wound well healed.

CASE 2. H.M., a 45 year old white male, entered St. Joseph Hospital, May 21, 1946 complaining of a dull pain in the right lower quadrant of his abdomen which had developed suddenly 4 days previous to admission. There was no nausea or vomiting. A

From Departments of Medicine of St. Joseph Hospital and Northwestern University Medical School.
Cajal D. *Id. J. Am. M. Ass.* 1946, 131: 318.



Figs. 1 and 2 Photomicrographs of tissue removed in Case 2. Note hemorrhage between the fat cells and marked hyperemia of blood vessels.

physician in a Boston hotel diagnosed the case as acute appendicitis but the patient refused surgery and returned to his home in Chicago.

Physical examination revealed an apprehensive man whose blood pressure readings were 160 systolic and 90 diastolic, tenderness rigidity and a suggestion of a mass in the right lower quadrant near Mc Burney's point temperature 99 degrees F and a leucocyte count of 11,350. A diagnosis of appendicitis was made. When the peritoneum was exposed, a thick indurated mass was encountered. This was the greater omentum adherent to the anterior parietal peritoneum. The parietal subserosa at the site was extensively infiltrated with hemorrhage and the omentum was thick and purple. A cut section through the removed omental mass revealed firm fatty tissue 8 by 3 by 1 centimeter with a large area of hemorrhage about 4 centimeters across and scattered small petechiae.

Microscopic sections revealed fatty tissue with hemorrhage between fat cells and marked hyperemia of the blood vessels (Figs. 1 and 2).

Studies the day after surgery revealed the ascorbic acid level 0.6 normal bleeding time, normal clotting time, normal platelet count, and normal prothrombin time. The capillary fragility test was strongly positive.

Subsequent questioning revealed that he took from four to ten drinks of whiskey each day and seldom ate citrus fruits or vegetables.

CASE 3 Mrs. K.L., a 30 year old white woman was admitted to St. Joseph Hospital August 12, 1946 complaining of severe abdominal pain which began suddenly about 5 hours previous to admission and was soon followed by vomiting. Physical examination revealed extreme tenderness and board-like rigidity of the abdomen with only occasional peristaltic sounds. Bowel obstruction or perforation of the viscus was suspected, but since ordinary percussion

of the chest and palpation of the muscles of the back and extremities revealed almost as much tenderness as was present in the abdomen and because of the lack of leucocytosis (8000) and fever surgical exploration was postponed.

Twenty four hours later carpopedal spasm with a positive Trousseau's sign and a positive Chvostek's sign was demonstrated and caused us to interpret the muscle pain as a spasm of tetany. Later the husband revealed a long history of alcoholism and a recent debauch in which no food had been taken for several days.

Blood findings fatty turbid serum nonprotein nitrogen 29 milligrams glucose 106 milligrams chlorides 510 vitamin C level, 0.28 inorganic phosphorus 1.8 calcium 6.5 amylase 112 per cent total protein 5.4 with 3.3 albumin and 2.1 globulin cholesterol 144. The low vitamin C level, low calcium low phosphorus low total proteins and the presence of fatty serum was interpreted as evidence of nutritional and vitamin deficiency. Intravenous calcium quickly controlled the muscle pain and spasm, and on a high protein regimen (supplemented by plasma) high vitamins large doses of vitamin C parenterally together with vitamin B complex, and liver extract, she improved promptly and left the hospital with normal blood findings.

SUMMARY

Three cases with symptoms pointing to an acute surgical disease of the abdomen showed laboratory evidence and clinical signs of scurvy. Two patients were subjected to surgery and hemorrhage was shown to be the basis of the peritoneal irritation.

The third patient not subjected to surgery had tetany as well as scurvy. The tetanic

spasms of the abdominal muscles probably accounted in part for the picture of an acute surgical condition. However in this case hemorrhage from scurvy may also have been present.

All the patients gave a history of a diet deficient in vitamin C. Two of the patients were discovered to be alcoholics while trauma to the abdomen was the aggravating factor in one case.

CONCLUSION

In the clinical diagnosis of acute surgical diseases of the abdomen spontaneous hemorrhages from nutritional deficiency or scurvy should be considered. Subclinical scurvy is recognized by consideration of the diet, by consideration of factors capable of inhibiting absorption of vitamin C by physical signs of scurvy by increased capillary fragility and by determination of vitamin C levels in the blood.

A SIMPLE AND ASEPTIC METHOD OF ILEOCOLOSTOMY

Dr J TEN KATE, The Hague Holland

IN shortcircuiting by lateral anastomosis between a proximal and a distal loop of intestine the chief concern is always the prevention of contamination of the operative field. It is very difficult after the intestine is opened to include the mucosa of the colon in the suture in such a manner as to prevent completely contamination of the operative field. Fortunately, with the use of the newer antibiotics the danger of contamination is much less than formerly. Nevertheless in patients debilitated by obstruction and intoxication serious infection may ensue. In addition the introduction of drains which many surgeons consider necessary in contaminated cases promotes a dehiscence of the suture line. For this reason surgeons try by one means or another to carry out aseptic anastomoses. The clamp and the coagulation methods are especially well known. When the clamp method is used (Rankin Stone) the suture is carried out over a specially constructed clamp which is removed at the last moment. Thus the intes-

tine is open only for a few seconds and at one place. According to Rankin in not one of his patients did leakage occur at this stage. When the coagulation method is used the mucosa of the intestine is not opened but is thoroughly coagulated. As soon as the coagulated mucosa sloughs off an open communication between the anastomosed loops is thus established. The difficulty with the coagulation method is to estimate the time necessary to assure that the sloughing off process is complete. We know of one case in which the ileus continued after this coagulation method had been used and death resulted.

Following is a description of a simple method which my former chief the late Dr Schoemaker briefly mentioned in an address on colon surgery before the meeting of the *Société internationale de Chirurgie* at Cairo in 1935 and which was named by his assistants the 'bird-cage' method. The advantage of this method is that an open communication is established immediately between the loops without the use of any specially constructed instrument. We have used the method in several cases and healing of the wound has always

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Fig. Posterior seroserosal suture.



Fig. 2. left. Incision of the intestinal wall all down to the mucosa.
Fig. 3. Suture of the posterior seromuscular flaps.

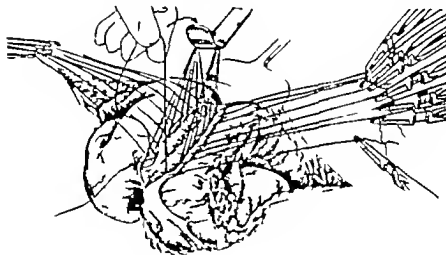


Fig. 4. Suture of the anterior seromuscular flaps with long threads the center part of which is elevated over blunt hook.

progressed without complications and without drainage

TECHNIQUE

The two segments to be joined are placed side by side for a certain distance, and a posterior (continuous) seroserosal suture is applied. The corner threads are fixed in a hemostat (omitted in Fig. 1). The intestinal wall is divided with a small extremely sharp knife down to the mucosa so that a sufficient oval of the mucosa lies bare. A second (continuous or interrupted) suture passes through the pos-

terior seromuscular flaps of both segments and is tied and cut short at once (Fig. 3).

The loops are now joined on the posterior side by two sutures, one seroserosal and one seromuscular. Long interrupted sutures are placed through both anterior seromuscular flaps. The threads are all elevated and collected, midway over a blunt hook or if need be, a finger of the assistant while both ends are held separately in hemostats (Fig. 4). When all the sutures have been inserted, the hemostats are replaced on each side by a strong intestinal

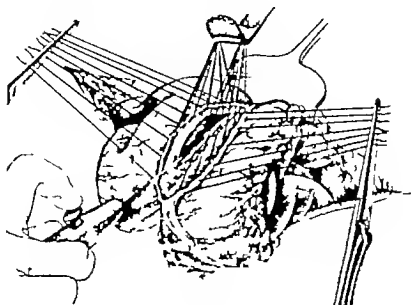


Fig. 5 Incision of the mucosa of both loops with a diathermy knife.

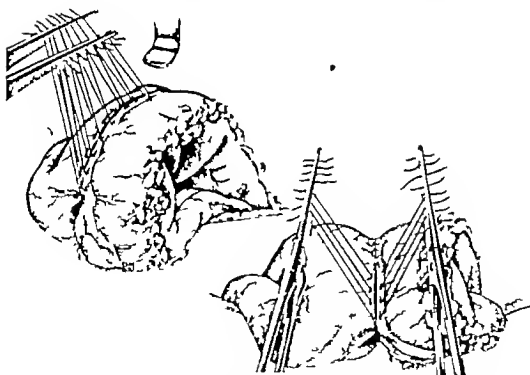


Fig. 6 Closure of the anastomosis by removal of the blunt hook and traction on the tensed threads in vertical direction

Fig. 7 Tying of the anterior seromuscular sutures one by one

clamp (Fig. 5) If the intestine is full the segments may be milked empty and blocked off by applying clamps across the gut near the anastomosis. When the intestine is not unduly distended the application of clamps can be dispensed with in most cases. While one assistant takes an intestinal clamp in each hand and pulls the threads taut and a second assist

ant or the surgical nurse elevates the center of the threads with a blunt hook the operator divides the mucosa on both sides with a diathermy knife (Fig. 5) The second assistant removes the blunt hook and the first closes the anastomosis by traction in a vertical direction (Fig. 6) With good assistants the whole procedure takes but a few seconds.



Fig. 2, left. Incision of the intestinal wall down to the mucosa.
Fig. 3. Suture of the posterior seromuscular flaps.

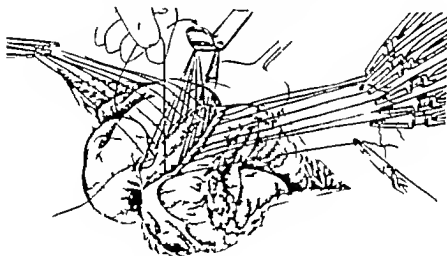


Fig. 4. Suture of the anterior seromuscular flaps with long threads the center part of which is elevated over a blunt hook.

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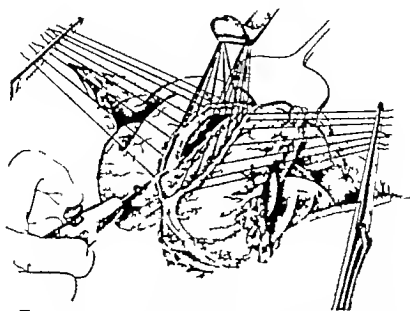


Fig 5 Incision of the mucosa of both loops with a diathermy knife.

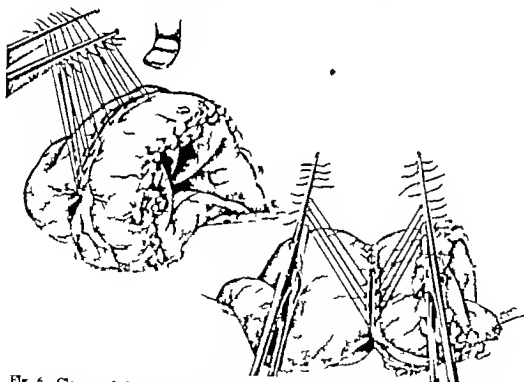


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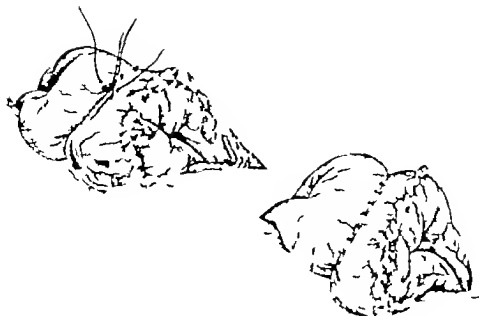


Fig. 8. left. Anterior sero-serosal uterine

Fig. 9. Anastomosis finished

Sometimes the incised mucosa may bleed considerably but that does not necessitate the ligation of the individual vessels for such a procedure would destroy the relative asepsis of this method. Although we have sometimes had copious diffuse bleeding from the incised mucosa we have never had serious complications from such bleeding. Besides our experience with the Schoemaker closed method of end-to-end union of intestinal segments without suture of the mucosa had convinced us of the harmlessness of mucosal bleeding.

Precaution should be taken also to avoid dividing the sutures with the diathermy knife therefore it is recommended that a relatively broad hook be used to hold the sutures so that access to the mucosa is facilitated.

While the assistant keeps the suture threads taut in a vertical direction the operator cuts the threads one by one just under the clamps and ties them (Fig. 7). When the tying of all these sutures has been completed then an anterior continuous sero-serosal suture is applied and the anastomosis is finished (Figs. 8 and 9).

To prevent the formation of a diaphragm by agglutination of the nonsutured mucosa layers (which we found once as the cause of death in a case of obstruction after a circular resection) it is advisable after the anastomosis is finished to introduce the thumb and index finger on either side to break up any possible agglutination and to be certain that continuity has been restored.

LATE RESULTS OF URETEROENTEROSTOMY

GEORGE GILBERT SMITH M.D. F.A.C.S., Providence Rhode Island

ANASTOMOSIS of the ureters to the sigmoid is a procedure which could be of great value in urology if we could be reasonably sure that the results over a period of years would be satisfactory. This study is presented with the hope that it will shed some light upon this problem.

During the past 17 years—from 1930 to 1946 inclusive—the writer has done this operation in 66 patients. 50 of these had both ureters transplanted in 16 only one ureter was so treated. The ureter which was not transplanted to the bowel was ligated in 6 transplanted to the skin in 8 not operated upon in 2. This makes a total of 116 ureters transplanted to the sigmoid.

The indications for ureteroenterostomy must be considered because the prognosis is much more favorable in some types of cases than in others. For example, the younger the patient the better the outlook. Individuals with cancer are generally in the older groups and frequently their strength and their resistance to infection have been depleted. Some undoubtedly have a smoldering pyelonephritis unrecognized before operation which later becomes active.

In the series of patients here presented the reason for ureteroenterostomy was radium burn of the bladder in 1 urinary incontinence in 2 submucous fibrosis in 4 exstrophy of the bladder in 6 vesicovaginal fistula in 6 and cancer of the bladder or of the bladder and urethra in 47. The radium burn of the bladder and one of the vesicovaginal fistulas were secondary to radiation treatment of cervical cancer. It is I trust unnecessary to say that in all of these patients with the exception of those with malignancy no solution of their difficulties other than transplantation of the ureters could be found.

The technique which was used in all but the last 6 cases was that known as Coffey One (1). This consists in severing the ureter 3 or 4

centimeters above the bladder and embedding the proximal segment in a trough in the wall of the sigmoid which has been made by dividing the serous and muscular coats of the latter for a distance of 4 centimeters. The floor of this trough is the intact mucosa of the bowel. A small incision through the mucosa is made at the lower end of the trough the end of the proximal ureteral segment is drawn into the lumen of the bowel by a double suture both ends of which are brought out through the intestinal wall 2 centimeters below the point of entrance of the ureter and there tied. The edges of the divided muscularis and serosa are then sutured over the ureter. The anastomosis can be done intraperitoneally or extraperitoneally. Both methods were used in this series neither appeared superior to the other.

In the last 6 cases implantation of the ureter in the trough was carried out without opening the lumen of the bowel and without severing the ureter. At the second operation approximately 2 weeks later the ureter was divided 2 centimeters below its emergence from the trough and the proximal end was then led into the lumen of the bowel as in the Coffey One technique. The principle of embedding the ureter in the intestinal wall and allowing it to become healed in the canal before the lumen of the bowel or of the ureter was opened (Coffey Three) (2) was first advocated by Coffey. It has been employed by Higgins (3) who as well as Coffey produced a fistula between the ureter and the bowel either by a constricting stitch or by electrocoagulation. Jewett has varied this technique by producing the fistula by means of an electrosurgical incision made by a device introduced through the proximal end of the ureter which had been divided below the point of emergence. The method followed by the writer and outlined above was first described by Winsbury White; it was also used by Nesbit.

The introduction of the sulfa drugs and the antibiotics has been a great factor in preventing the calamities which sometimes attended



Fig. 1. Excretory urogram years after bilateral ureteroenterostomy for submucous fibrosis. Nonprotein nitrogen 70 milligrams per cent.

such operations before these aids to intestinal antisepsis were known. These agents have also been helpful in preventing the development of pyelonephritis during the postoperative period. Experience has taught us also that deep x ray therapy to the pelvis, by causing fibrosis of the lower ureters, is sometimes responsible for sloughing of the transplanted ureter.

Of the 66 patients operated upon 12 (18+%) died in the hospital. Autopsies were secured in all but one. Ten of these were operated upon for cancer of the bladder, 2 for irradiation necrosis of the bladder following radium and x ray treatment of cancer of the cervix. The causes of death were faulty healing of the anastomosis in 3, sepsis in 2, pyelonephritis in 2, embolism of the femoral artery in 1, thrombosis of the iliac vein, inferior vena cava and left renal vein in 1, streptococcus infection following removal of a nonfunctioning kidney



Fig. 2. Ureteroenterostomy for exstrophy of bladder in 1930; left nephrectomy for stone in 1935; excretory urogram in 1944. Nonprotein nitrogen 43 milligrams per cent.

in 1. No cause was found in 1 coronary thrombosis in 1.

Seven of the above 12 patients had their bladders removed, 32 who had had cystectomy because of cancer and 5 because of exstrophy were discharged from the hospital.

Of the 54 patients who left the hospital alive, 8 died of renal failure, 5 in 1 year or less, 3 between 1 and 2 years. Four others had skin ureterostomies, 3 within 1 year, one 3 years after ureteroenterostomy. At least 4 of those who died should have had their kidneys drained. It is probable that several of these patients would now be alive if the ureters, or even if one ureter had been brought out to the skin. Such a patient was operated upon in September 1945. Left ureteroenterostomy was done, the right ureter ligated and the bladder removed 2 weeks later. Three weeks after that, the right kidney was removed as it was functionless. The patient made a good recovery and

went South. In May 1946 he returned and was seen by my associate, Dr Leadbetter during my absence. He found that the left kidney was not functioning well and advised ureterostomy. The patient did not follow this advice; he continued to fail and at the last moment, left nephrostomy was done. He died 4 months after being advised to have a ureterostomy. Autopsy showed a septic kidney; no cancer was found.

Fourteen patients died from recurrence of their bladder cancer. In 8 of these patients renal function appeared to be satisfactory.

Of the patients who are still living, 3 have unsatisfactory kidney function. A woman 54 years of age was operated upon in 1934 because of a vesicovaginal fistula which had resisted a number of attempts to repair it. In 1938 her left kidney was removed because of calculous pyonephrosis. Now 9 years later her right kidney is enlarged; her nonprotein nitrogen is 91 milligrams per cent and her blood pressure is usually about 215/120. She is almost bedridden.

Another woman, aged 59 in 1934, had her ureters transplanted because of a severe submucous fibrosis. She had been well until lately but now is in a hospital with nonprotein nitrogen of 70 milligrams per cent. Her intravenous pyelograms made 3 months ago showed slight dilatation although both kidneys excreted diodrast (Fig. 1). She is now 74 and probably would not wish to have the ureters brought out to the skin.

A third patient, a young man of 19, had bilateral ureteroenterostomy for exstrophy of the bladder in 1930. In 1935 a left nephrectomy was done for calculous pyelonephritis. He came to the office a few weeks ago at my request as he had not been seen since 1941. At that time an intravenous pyelogram had shown considerable dilatation of the calices, pelvis and upper ureter on the right; his nonprotein nitrogen was 43 milligrams per cent (Fig. 2). At this last visit his nonprotein nitrogen had risen to 49 milligrams per cent and his blood pressure was 0/140. An intravenous pyelogram shows poor excretion of dye but much less dilatation (Fig. 3). In spite of this he is working as an accountant and considers himself in good health. It is doubtful



Fig. 3. Excretory urogram taken in 1947 of patient whose 1941 urogram is shown in Figure 2. Nonprotein nitrogen 49 milligrams per cent. Blood pressure 220/140.

whether surgical drainage of the kidney should be advised.

Some surgeons prefer nephrostomy to ureterostomy. Our experience leads us to favor the latter because the operation is less severe and because the location of the drainage tube is more convenient for the patient. Neither method is ideal. In a series of 22 skin ureterostomies studied a few years ago there were 4 deaths from pyelonephritis occurring from 1 to 10 years after operation.

Among the 66 patients in the present series there are living in addition to the 6 patients whose ureters are not functioning satisfactorily, 18 whose renal function is reasonably adequate. The time elapsed since operation is: 1 year or less in 2; 1 to 2 years in 2; 2 to 3 years in 3; 3 to 4 years in 1; 4 to 5 years in 1; 6 to 7 years in 2; 8 to 9 years in 4; 10 to 11 years in 1; 11 to 12 years in 1; 12 to 13 years in 1.

One of these patients, a girl of 18 who was operated upon for exstrophy in 1936, delivered herself of a living child 3 years ago. She had no renal complications during or after her pregnancy although her left kidney showed diminished function in 1939. Her nonprotein nitrogen now is 31 milligrams per cent. Another girl, age 30 at the time of operation, had ureteroenterostomy for exstrophy of the bladder in 1936. Ten days after her left ureter was transplanted she developed pyelonephritis.

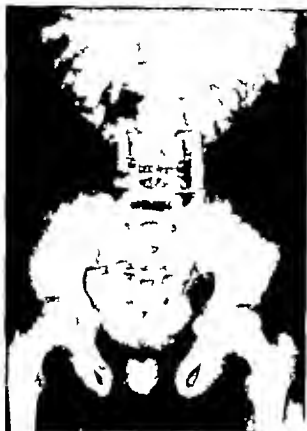


Fig. 4. Excretory urogram in boy 1 year after ureterocentrostomy and cystostomy for bladder



Fig. 5. Excretory urogram of patient in Figure 4 15 years after operation. Note improved renal drainage.

the ureter was exposed and found to be indurated and acutely inflamed. It was opened with the escape of thick pus and a catheter was passed downward into the bowel where it was left for 10 days. The urine was drained by a temporary nephrostomy. The excretory urograms in 1943 showed slight dilatation of

the right pelvis and ureter very little dilatation and good function on the left. Her non protein nitrogen was 16 milligrams per cent.

Six of the patients now alive had cystectomy for cancer 5 of these have gone less than 3 years one is well 7 years after operation One has recurrence in the anterior vaginal wall

TABLE I.—RESULTS ACCORDING TO DIAGNOSIS

Diagnosis	N	Dead in hospital	Dead recurrence	Dead other causes or of cause unknown	Dead pyelonephritis	Living (4) Renal function		Ureterocentrostomy (secondary)
						Satisfactory	Unsatisfactory	
Cancer bladder			14	6	3	6		
Vesicovaginal fistula	5							
Vesicovaginal fistula carcinoma cervix								
Cystostomy	9					5		
Subvesical fibrosis								
Incontinence								
Radiation necrosis bladder								
	66					7		4



Fig 6 Sixty minute excretory urogram 2 weeks after completion of both ureteroenterostomies



Fig 7 Thirty minute excretory urogram 2 weeks after completion of both ureteroenterostomies.

one is now convalescent one at the end of 2 years and 2 at the end of 3 years are in excellent health. Another is alive after 2 years but has severe cardiac disease and is not in good health.

Tabulation of the patients according to diagnosis shows the marked difference in results between the patients in whom malignancy was not a factor and those in whom (Table I) the ureteral transplantation was done because of cancer of the bladder or because of the results of radiation for cancer of the cervix. The 14 who died of recurrence added to the mortality in the malignant group. Fourteen others—29 per cent of the malignant group—died within 3 years of operation from renal complications or from causes which could not be determined. Nine (18%) of this group with cancer are now living, 3 with ureterostomies.

In contrast to the above results among the 71 patients in the nonmalignant group one

died of liver disease, one of pyelonephritis, 15 are living. Figures 4 and 5 show an excellent result following ureteroenterostomy in a child.

Of the total patients, 24 in number who are living anywhere from a few months to 17 years since operation, 13 have been found by recent examination or have been stated by their doctors to have satisfactory renal function. Four others have had bilateral ureterostomies. Four are known to have poor function in one or in both kidneys. Three have not been checked recently but were well at last report.

In several of the patients with inadequate renal function it has been found that there is very little dilatation of the renal pelvis now although there had been considerable in the past. In one such case a nephrostomy was done; the kidney was contracted and scarred, the pelvis and upper ureter not at all dilated. Nephrostomy brought about marked improvement in the patient's condition within a few



Fig. 8. Twenty minute excretory program after the completion of the operative procedure of bilateral ureterostomy



Fig. 9. Twenty minute excretory program 3 years after operation. Nonprotein nitrogen 47 milligrams per cent. Same case as in Figure 8

days the elevated nonprotein nitrogen became normal. Bilateral skin ureterostomy was done a few months later with excellent results. She has gained 35 pounds in weight, and feels better than she has felt in the past 12 years. Her nonprotein nitrogen however is now 48 milligrams per cent.

Review of this series of patients shows no immediate mortality in the nonmalignant cases, and in those with malignancy a hospital mortality of 18 per cent. This is not excessive in view of the prognosis without radical operation. The high incidence of death from recurrence (about 30%) argues for greater conservatism in the selection of cases for total cystectomy. It would have been better in certain of these patients with single infiltrating tumors to have electrocoagulated the tumor thoroughly through the open bladder. The cases best adapted to cystectomy are those patients with

multiple, persistently recurring tumors of the lower grades of malignancy.

The real problem has to do with the preservation over a long period of years, of the renal function. We do not know why some kidneys after ureteral transplantation remain normal for years, while others cease to function. Not infrequently one kidney will remain healthy although its fellow atrophies.

The two agents chiefly concerned in this problem are obstruction and infection. Unquestionably there is some factor involved in the transplantation which is responsible for the poor result, but it is usually unrecognized by the surgeon at the time of operation. What is needed is a foolproof method of transplantation which if done with reasonable skill, will guarantee results.

The method of transplanting the ureters in continuity described earlier in this paper may

possibly be the answer. The logic behind this technique lies in the fact that the ureter becomes healed in the intestinal wall before either lumen is opened. The likelihood of the ureter becoming encased in a plastic layer of inflammatory tissue is materially lessened. At the second operation, before implanting the severed ureter in the intestinal lumen, bougies may be passed up the ureter to demonstrate its patency.

The second stage may be difficult because of adhesions or inaccessibility of the anastomosis but these factors can be foreseen and to a large degree prevented. The transverse incision for example gives much better access to the pelvic walls and if the anastomosis is not made too low in the sigmoid it will be more accessible. Five of the 6 cases in which this method was used by the writer have done well so far as the ureteroenterostomy was concerned. These 5 had cancer of the bladder. The sixth patient died in 6 months, probably from pyelonephritis; he was operated on for incontinence (Fig. 6). Two have died: one at 5 months from coronary thrombosis, one at 9 months from recurrence of the carcinoma (Fig. 7). Both are reported to have had no urinary difficulty. Another was operated on only 3 months ago; the right ureter was transplanted by this method, the left by Coffey's one technique and it must be admitted that there is as much dilatation on the right as on the left. Another returned to the hospital 6 months after operation with fever and right upper quadrant pain; he was in acute cardiac decompensation, the nonprotein nitrogen was 158 milligrams per cent but fell rapidly to 52 milligrams per cent. His doctor 1½ years later said the patient had had no trouble with his kidneys since then.

The remaining patient operated on over 3 years ago was seen recently. Her nonprotein nitrogen was 47 but intravenous pyelograms showed a very satisfactory result. She feels perfectly well (Figs. 8 and 9).

In conclusion, let me say again that ureteroenterostomy is a procedure of the greatest value. The results in patients with cancer

have been far from satisfactory, of 49 patients only 9 (18%) have survived and only 1 of these has gone over 3 years. In nonmalignant cases the results have been much better but the late development of renal failure in some patients has been discouraging. It is to be hoped that new and better techniques for the anastomosis of the ureter to the bowel will be forthcoming. In the meantime, we must stand ready to establish better drainage by ureterosomy or nephrostomy for those kidneys which are not functioning satisfactorily after ureteroenterostomy.

SUMMARY

1. The results of ureteroenterostomy in 66 patients operated upon in the period 1930 to 1946 are tabulated.

2. In 47 patients with cancer of the bladder and 2 with treated cancer of the cervix there were 12 hospital deaths and 14 deaths from recurrence of the cancer. Eight died, after discharge from the hospital, of pyelonephritis.

3. In 17 patients operated upon for nonmalignant conditions there were no hospital deaths and only 1 death later from pyelonephritis.

4. Of 24 patients now alive, 17 have satisfactory renal function, 3 show signs of renal failure, 4 have required skin ureterostomies.

5. In at least 4 of the patients who died of pyelonephritis renal drainage by ureterosomy or nephrostomy would probably have materially prolonged life.

6. In patients who have had ureteroenterostomy, the renal function should be followed by determination of nonprotein nitrogen and by excretory urograms at least once a year. If the kidneys show evidence of progressive failure nephrostomy or ureterosomy should be done.

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EDITORIALS

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AUGUST 1947

SURGERY OF THE ENDOCRINE GLANDS

OUR surgical experience with lesions producing metabolic disturbances has greatly increased the past few decades. In addition extensive investigative work has been carried out in this field of disease. The knowledge obtained from these sources has enabled us better to understand this group of diseases. In some of them we have developed a method of clinical relief in others unfortunately we have learned that these metabolic syndromes are not as simple as we at first thought them to be. Most lesions that produce metabolic disturbances are operated upon by the general surgeon. The neurosurgeon, gynecologist or urologist, however, treat some of these lesions, such as tumors of the pituitary, ovaries, or adrenal glands.

The diagnosis and treatment of thyrotoxicosis have improved so much that the mortality and morbidity occurring in its management

have been reduced to a minimum. In 1943 Aastwood introduced thiouracil for the treatment of this disease. As happens with most new therapeutic agents it was received with a wave of great enthusiasm. This enthusiasm diminished considerably when we learned that the number of permanent remissions obtained in treating thyrotoxicosis was not as great as was at first anticipated. It has been tried in recurrent cases following thyroidectomy and the results are not too encouraging. In the Presbyterian Hospital in New York it was used in twenty-five recurrent cases; fifteen showed recurrence of symptoms in from one to six months after discontinuation of the drug—most of them in three months. The enthusiasm was further reduced when agranulocytosis, a complication due to the toxicity of the drug, was reported in some cases. Frequent blood counts should be included in the routine when patients are taking this drug to detect any early evidence of anemia or agranulocytosis. This complication is rarely fatal when recognized early; the drug discontinued and treatment instituted; nevertheless, Beler, Waltes and Sturgis recently reported an analysis of 10 fatal cases which they collected from the literature and by personal communication. Microscopical studies show that thiouracil produces hyperplasia and increased vascularity of the gland. This has been responsible for the surgeon encountering more hemorrhage in operations performed upon patients prepared by this drug preoperatively. This factor has led many surgeons to feel that thiouracil has a distinct disadvantage over iodine and has little or no advantage in the preoperative preparation in cases of mild or moderate toxicity. Many feel however that thiouracil has won

its niche in the preoperative preparation of cases of severe thyrotoxicosis. In these cases many clinicians use it until the symptoms have improved appreciably and the basal metabolic rate has been reduced to about half of its original reading. Then the drug is discontinued and iodine substituted to complete the preoperative preparation. Under this therapeutic regimen the hyperplasia and vascularity are reduced, resulting in the reduction of hemorrhage encountered in thyroidectomy. Thiouracil is of value in the preoperative preparation of patients who cannot tolerate iodine in severe thyrocardiacs and in patients who obviously would not stand or who refuse operation. One of the related drugs such as propylthiouracil, may prove less toxic and our deductions changed accordingly.

Apathetic thyrotoxicosis as described by Lahey in 1931 merits consideration. Since this contribution we have noted an increasing number of this type of thyrotoxicosis. Lahey not only cited the high operative mortality in this group but also pointed out that if this condition is not recognized it may be responsible for the death of a patient operated upon for some other surgical condition.

As in other diseases we now realize that liver damage plays a very significant part in fatalities from thyrotoxicosis. Two types of liver pathology have been described in this disease. Several liver function tests have been used to determine clinically the degree of liver damage. It has been advocated that liver damage plays such an important part in thyroid crises that we should call them liver crises. Chesky reported favorable results in a series of cases of advanced liver damage in which he added intravenous glucose with insulin, liver concentrate, and glycine to his routine treatment.

Surgery performed upon the diabetic is one of the most interesting of surgical fields. It

was one of the first types of surgery in which we learned that the combined management of the internist and surgeon was essential both to progress and the proper care of the patient. Though our mortality and operative results have improved tremendously, there is still room for improvement in the management of emergency cases. An important accomplishment in this field is the recognition of the fact that early diabetic acidosis has a group of symptoms identical with that of many acute abdominal conditions. We no longer wait until the patient exhibits drowsiness or coma before we think of acidosis. The recognition of this hazardous complication in its earlier stage has diminished the number of patients operated upon in its presence and thereby lowered our operative mortality.

Refrigeration in the management of cases of diabetic gangrene has proved to be of definite value. We first used this procedure only in patients who were very toxic, the result of absorption from the gangrenous process. Today refrigeration is a routine preoperative measure if the gangrene is complicated by gross infection. In operations of election we can now properly prepare the diabetic so that he is as good an operative risk as is the condition of his cardiovascular system.

The number of cases treated for hypernatulinism is very slowly increasing. Unfortunately no one surgeon has the opportunity of treating or operating upon many patients with this condition. The triad of symptoms characteristic of hypernatulinism have been well recognized. They are (1) attacks of hypoglycemia coming on during the fasting or overfatigued state, (2) associated blood sugar readings of 50 millimeters per 100 cubic centimeters or less during the attacks, and (3) relief of the shock promptly following the ingestion of glucose. Some very gratifying results have been reported when a tumor of the

islands of Langerhans has been found and removed at operation. A few cases of extra pancreatic islet tumors appear in the literature. These cases show the necessity of exploring the entire pancreas, duodenum, and other neighboring tissues before we consider our exploration for tumor complete. The real problem is the case in which no tumor is found. We have called these the functional type, and partial to subtotal pancreatectomies have been performed in an effort to obtain a cure. Follow up studies in these cases have not been as encouraging as we at first hoped they would be.

A fairly well established routine has developed in the diagnosis and treatment of hyperparathyroidism. The infrequency with which this lesion is encountered has prohibited too great progress in this field. The incidence is substantially higher in those clinics where hyperparathyroidism is carefully sought among patients presenting themselves because of renal calculi. It is important that hyperparathyroidism be recognized even in such cases in which characteristic skeletal disease is absent because of the possibility of disastrous injury to kidney function. Just as primary hyperparathyroidism can induce serious kidney disease, serious primary kidney disease may result in a compensatory secondary hyperparathyroidism. The treatment of primary hyperparathyroidism is surgical; that of secondary hyperparathyroidism is not.

Tumors of the adrenal gland present a very complex picture. Occasionally in the course of a sympathectomy for hypertension a tumor is found in this gland which has produced no symptoms. The surgeon should be aware of the fact that a common complication following operation for a tumor of adrenal gland, whether it be cortical or medullary in origin, is adrenal insufficiency. Its treatment is the same as is used when it occurs in Addison's

disease. The more important symptoms of this condition are nausea, vomiting, weakness, a rapid weak pulse, and falling blood pressure. The patient should be checked for the development of these symptoms, as there is a high mortality in those who develop adrenal insufficiency. A valuable aid in the diagnosis of adrenocortical tumors is the quantitative determination of the 17 ketosteroids in urinary assays. Callow, Talbot, and others have worked with this procedure very extensively and have established normal values in children and adults. If the determination of the 17 ketosteroids is 30 milligrams or over, it is very likely to be due to an adrenocortical carcinoma.

Would it not be well to have the lessons that occur so infrequently treated by a group of physicians particularly interested in this field of surgery? Then the intricate details of study and treatment may be carried out more thoroughly and greater progress would be made.

FREDERICK A. BOTHE.

EARLIER ILEOSTOMY IN SEVERE ULCERATIVE COLITIS

THE decision for or against recovery in patients with severe ulcerative colitis is very often settled by the time an ileostomy is done. When patients in the acute stages of ulcerative colitis are permitted to go on to the point where everyone connected with the case—surgeon, physician, and the patient's relatives—agrees that the patient must have an ileostomy in order to save his or her plainly threatened life, the mortality of the procedure will be, and has been, distressingly high.

It is unfortunate that several factors operate to bring about delay in these often severely ill patients. Sometimes these patients have been through previous acute episodes of ulcerative colitis, have spontaneously recovered from

them and have had varying periods of remission from the bloody diarrhea together with the fever and toxicity which is associated with it, thus encouraging them to persist unduly with conservative measures again during subsequent acute episodes. Sometimes the mixed infections superimposed upon these acute ulcerative processes previously have been controlled by sulfasuccinate or some of the other intestinal antiseptics of the sulfa group again encouraging delay and undue dependence upon these agents. Sometimes the physician in charge of a patient in such an acute stage of the disease has not had enough experience with it to be aware how quickly patients with relatively well controlled ulcerative colitis can with but little apparent cause (emotional upsets or associated infections such as influenza) change to states which are real emergencies such as bleeding from the colon which can threaten life by exsanguination progress of the ulcerative process which can and does bring about perforation toxic states as the result of the colon infection which threaten life by the intensity of the infection and nutritional changes and avitaminosis as the result of the frequent loose stools which bring about serious prospects of a fatality.

Added to the above stated deterrents to an early ileostomy is the fact that until recently a patient with an ileostomy was one to be really pitied since there was no adequate way of controlling either the character or the frequency of the liquid discharges from his or her ileostomy no bag which would really keep him from soiling his clothes or smelling and in many of the cases the skin about the ileostomy was so irritated by the discharges from the ileum that in spite of all protective measures patients were constantly disturbed and distressed by an ileostomy.

All of the features of this distressing and serious disease so prejudiced patients their

relatives surgeons gastroenterologists and physicians against this enterostomy that it was delayed in a great many cases with considerable justification until the patient's condition was so desperate that with all of the objectionable drawbacks, ileostomy was accepted rather than the impending and obvious fatality about to occur. Evidence of the truth of these statements is the fact that in our first 80 patients upon whom ileostomy was done our mortality rate was 26 per cent directly the result of the lateness in the acute stage of the disease at which these patients were submitted to ileostomy.

It is because almost all of the drawbacks previously and rightly charged to ileostomy have been overcome that I wish to urge earlier ileostomies followed in many cases by later partial or complete colectomies. We have advocated and practiced early ileostomy for any patient not doing well under medical management committing ourselves to the program of disconnecting the ileostomy and restoring the fecal stream under the following conditions when following the ileostomy the patient has remained free from all symptoms for a considerable time when haustrations as shown by barium enemas have returned to normal in the colon when by sigmoidoscopic examination the lower bowel and rectal mucosa prove normal in appearance and when in addition the patient and family understand that the restoration of the fecal stream may reactivate the ulcerative colitis process and make another and permanent ileostomy necessary.

Many patients with ulcerative colitis may be satisfactorily maintained on a medical regimen (diet, psychogenic control and typhoid vaccine) but when these measures no longer prove satisfactory we urge and practice earlier ileostomy in these patients and have convinced our gastroenterologists and medical consultants of the wisdom and life-saving value of

THE SURGEON'S LIBRARY

REVIEWS OF NEW BOOKS

THE subjects discussed in *Physical Medicine in General Practice*¹ cover the fields of medicine surgery and the specialties in which physical medicine has proved of value either from a therapeutic or diagnostic standpoint. Anyone reading this volume will be convinced that this field of therapy offers many advantages and has wide possibilities. The editor Dr Watkins has assembled a group of contributors all of whom are outstanding in the field. As the result of long practical experience and years of study each of these contributors is in a position to discuss with authority the various subjects that are included under the broad heading of physical medicine.

The contributions have been written primarily for practicing physicians and surgeons. The technical side of physical medicine is minimized and emphasis is placed upon the clinical application of the different techniques in physical medicine to the various conditions most commonly encountered by the practitioner. This book should be in the library of every general practitioner. JOHN S. COULTER.

IN the monograph entitled *The Peripheral Circulations in Health and Disease*² Dr Robert L. Richards has furnished clinicians an excellent review of vascular disorders of the extremities. The monograph is particularly interesting because it presents British and European views and records experiences during the war with peripheral nerve injuries and the immersion foot syndrome. Chapters on occlusive vascular disease and the Raynaud phenomenon are direct and clinically useful and present the stimulating views of Sir Thomas Lewis and George W. Pickering. Practical summary of methods of study of peripheral vascular disease and of anatomical and physiologic phenomena further enhance the value of this monograph. It can be well recommended to those treating patients for disease of the extremities. K. S. GRIFFIN

NO one can read this concise and well written account³ of one hundred cases of advanced cancer by Dr Brunschwig without recognizing the

PATIENTS IN GENERAL PRACTICE. The American Practitioner Series. Edited by Arthur L. Watkins, M.D. Philadelphia, London, and Montreal: J. B. Lippincott Co., 1947.

THE PERIPHERAL CIRCULATION IN HEALTH AND DISEASE. A STUDY IN CLINICAL SCIENCE. By Robert L. Richards, M.D. Foreword by J. R. Leatham, C.B.E., Ch.M. F.R.C.S. Baltimore: The Williams and Wilkins Co., 1946.

RADICAL SURGERY IN ADVANCED ABDOMINAL CANCER. By Alexander Brunschwig, M.D. Chicago: The University of Chicago Press, 1947.

courage and surgical skill that have made possible the results that have been achieved.

The author justly emphasizes the many developments that have made prolonged and difficult surgical procedures possible—massive blood transfusions, continuous spinal anesthesia, parenteral feeding, vitamin therapy, chemotherapy, to mention the most important—but it is obvious that none or all of them can avail unless they are utilized wisely and are combined with discriminating judgment, surgical skill, and a determination not to admit defeat when the possibility of success remains.

After brief introductory chapters dealing with the historical aspect of surgery for abdominal cancer, indications and contraindications for treatment and supportive treatment, the recorded cases are divided into groups according to the anatomical structures chiefly or primarily involved—stomach, small intestine, colon, pancreas, liver, bile passages, spleen, adrenals, and pelvic viscera. A chapter upon injuries to the hepatic artery, portal vein, and superior mesenteric vessels follows the chapter on carcinoma of the extrahepatic bile ducts.

The classification of cases mentioned, however, hardly gives an indication of the extent of the operative procedures carried out. In almost every instance operation involved the removal of diseased structures adjacent to the viscera primarily involved, for example, in a case of primary carcinoma of the pancreas, removal of the tail of pancreas, the spleen, five-sixths of the stomach, umbilicus, and falciform ligament (Case 36, page 195); in a case of primary carcinoma of the splenic flexure, removal of the left half of the transverse colon with its omentum, the spleen, lower three-fifths of the stomach, and the body of the pancreas (Case 38, page 164), following an operation for gastric carcinoma, removal of most of the transverse and descending colon with the omentum, 35 centimeters of jejunum, and 15 centimeters of the ileum (Case 6, page 101). These and other cases with even more extensive involvement are discussed in detail and illustrated with diagrams of the operative procedures and such excellent photographs of surgical specimens that the reader can visualize clearly the serious problems encountered and the surgical procedures applied.

The results obtained by the extensive operative procedures carried out are carefully recorded in each case report and summarized in a final chapter entitled "Results of Radical Surgical Excision in 100 Cases." In 19 of the 100 cases prolonged palliation was obtained and all 19 patients resumed their nor-

The certainty with which such hypotheses are stated as facts suggests a somewhat uncritical scientific approach to the complex problems of hormone interrelationships.

An immense bibliography of 544 items contains only a rare reference to work as late as 1940. It is regrettable that the 20 page English summary could not have been written by one more familiar with the language. On the whole this book has little to offer to the student of endocrinology.

SOMERS H. STURGIS

AN excellent summary of present day gynecologic endocrinology is contained in Dr. Claude Bédère's new book *Diagnostic hormonal et traitements hormonaux en gynécologie*. The book represents however the experience and methods of the author rather than presenting a consensus of opinions. This book is not a bibliographic compilation, says the preface, a statement borne out by only 103 references of which almost two-thirds refer to the author's own papers. The handling of topics is quite dogmatic and inflexible and gives the impression that most endocrine conditions can be easily diagnosed and that treatment is invariably satisfactory and certain.

There are numerous points of difference between contemporary American literature and Dr. Bédère's book to wit:

Although considerable doubt has been cast on the use of progesterone in habitual abortion in recent

DIAGNOSTIC HORMONAL ET TRAITEMENTS HORMONAUX GYNÉCOLOGIE. By Claude Bédère. Paris: Masson et Cie, 1946.

years, Dr. Bédère feels that treatment by corpus luteum hormone gives remarkable results in cases of habitual abortion. In discussing testosterone Hamblen "condemns its use for any reason whatsoever in the female" while Dr. Bédère states that testosterone constitutes the present treatment of choice of functional uterine hemorrhages and advises its use in the treatment of hemorrhages due to uterine fibromyomas, premenstrual mammary pain, precocious breast development and in the treatment of a variety of premenstrual and postmenstrual symptoms. He feels that each time that one wishes to have a direct checking action upon the hypophysis with the minimum of extrinsic action one should use the male hormone.

The subject of sterility is covered in four pages. The physiology of the transport of sperm and egg is briefly discussed. Dr. Bédère states that chronic genital infections and especially gonococcal infections are the principal cause of primary or secondary sterility in women and female sterility is far more frequent than male sterility. He attributes a certain number of cases of female sterility to spasm of the uterine isthmus. There is no discussion of testicular biopsy or of the value of thyroid extract in the treatment of infertility.

In spite of the criticisms that have been made the book is well planned, well arranged, and very clear and definite in its phraseology. It will prove of great value to the general practitioner in France and contains much to interest and challenge the American gynecologist who is interested in endocrinology.

CRAIG W. MUCKLE

BOOKS RECEIVED

Books received are acknowledged in this department, and such acknowledgment must be regarded as a sufficient return for the courtesy of the sender. Selections will be made for review in the interests of our readers and as space permits.

RE: ITS RELATION TO CONGENITAL HEMOLYTIC DISEASE AND TO INTRAGROUP TRANSFUSION REACTIONS. By Edith L. Potter, M.D., Ph.D. Chicago: The Year Book Publishers, Inc., 1947.

BOCCAARD'S MANUAL OF ANATOMY, 7th ed. Edited by F. Wood Jones, D.Sc. (London, Adelaide and Melbourne). M.Sc. (Manchester), M.B. B.S. (London), F.R.S. F.R.C.S. (England). Baltimore: The Williams & Wilkins Co., 1946.

SURGICAL PATHOLOGY. By William Boyd, M.D. (Dipl. Psychiat.), M.R.C.P., (Edinburgh), F.R.C.S.P. (London), LL.D. (Seattle), M.D. (Oslo). F.R.C.S. Philadelphia and London: W. B. Saunders Co., 1947.

COLOR ATLAS OF HEMATOLOGY WITH BRIEF CLINICAL DESCRIPTIONS OF VARIOUS DISEASES. By Roy R. Knacke, M.D. Philadelphia, London, Montreal: J. B. Lippincott Co., 1947.

HUMAN GASTRIC FUNCTION; AN EXPERIMENTAL STUDY OF A MAN AND HIS STOMACH. By Stewart Wolf, M.D.

and Harold G. Wolff, M.D. London, New York, Toronto: Oxford University Press, 1947.

DISEASES OF METABOLISM. DETAILED METHODS OF DIAGNOSIS AND TREATMENT. A TEXT FOR THE PRACTITIONER. Edited by Garfield G. Duncan, M.D. Philadelphia and London: W. B. Saunders Co., 1947.

GYNÉCOLOGY WITH A SECTION ON FEMALE UROLOGY. By Lawrence R. Wharton, Ph.D., M.D., 2nd ed. Philadelphia and London: W. B. Saunders Co., 1947.

CARE OF THE BREAST. Dr. Elise K. LaRoc, M.D. New York: Froben Press, 1947.

CHIRURGIE DER INFESTIONEN MIT WEITGEHENDEN BEZÜCKSICHTIGUNG DER BEHANDLUNG. By Prof. Dr. Rudolf Demel. Wien, Austria: Verlag Wilhelm Maukdrich New York: Grune & Stratton, Inc., 1947.

APORTACIONES A LA MEDICINA PSICOMÁTICA. By Dr. Enrique V. Salento. Buenos Aires: C. Vergara, 1946.

DOLORES MORTALES ALGIAS ESPLÉNICAS. By Dr. Miguel López Escobar. Mexico: Gonzalez Porto (Oteha), 1947.

LA EQUIDOCOSIS OSEA. By Herbert Cagnoli. Montevideo: Casa Impresora "La Industrial," 1947.

PERIPHERAL VASCULAR DISEASES (Angiology). By Saul S. Samuels, A.M., M.D. London, New York, Toronto: Oxford University Press, 1947.

PRELIMINARY PROGRAM—1947 CLINICAL CONGRESS

ous hospital departments and their personnel nurses, dietitians, medical records librarians, and many other persons directly concerned about hospital progress, will be interested in the discussions of current hospital problems.

The Monday afternoon session will be devoted to a panel discussion on current problems in medical service in hospitals. Tuesday morning to improvement in food service in hospitals. Tuesday afternoon to improvement in nursing service in hospitals. Tuesday evening to a joint session for hospital trustees, medical staff officers, and administrators, Wednesday morning to discussion of personnel and public relations. Wednesday afternoon to a joint session with the American Association of Medical Record Librarians on improving medical records. Wednesday evening to a forum on trends in hospital administration and special hospital problems. Thursday morning to a forum on special problems. Thursday afternoon to a round table conference on problems of the small hospital in meeting the standards of the American College of Surgeons and to a symposium on Graduate Training in Surgery and Thursday evening to a special conference on the point rating system. Detailed programs appear on succeeding pages.

ANNUAL MEETING

The annual meeting of the Governors and Fellows will be held on Thursday afternoon at 1:45. There will be election of officers and governors. The annual meeting affords the Fellows of the College an opportunity to hear reports of officials on the work of the organization and to broaden their knowledge of the methods, and their effectiveness, which are used to raise the professional and ethical standards of surgery and to promote good hospital care and general improvement in the practice of medicine. Each Fellow has a personal part in this work and may extend the influence of the College materially in his local community and wherever his contacts extend. Hospital Standardization particularly offers him wide opportunity to provide better medical care for his patients in the hospital in which he works, through continuous progress in applying the principles of the Minimum Standard which insure the best care of the patient.

Every Fellow will be interested in the reports which will be presented on the following subjects: finances, Hospital Standardization, Graduate Training in Surgery, Medical Motion Pictures, Publications, Public Relations, Library and Literary Research, the work of the state and provincial credentials committees, committees on applicants, and the Committee on History Reviews.

Sectional Meetings, 1947 and the Department of Clinical Research, including cancer clinics and cancer detection centers, the Committee on Cancer Medical Service in Industry and the Committee on Fractures and other Traumas. Dr. Abell, Chairman of the Board of Regents, will report on administration of the College and Dr. Arthur W. Allen will discuss the obligations and opportunities of the Fellows.

MEDICAL MOTION PICTURES

The latest available films demonstrating surgical procedures and related subjects will be shown in the medical motion picture exhibits which will be held daily in The Waldorf Astoria. Motion pictures are a much appreciated feature of the Clinical Congress. Many new pictures on varied subjects are being received by the American College of Surgeons for review. Both sound and silent colored films will be shown during the Congress all of which will have been approved by the Committee on Medical Motion Pictures.

There will also be shown the first of a series of films which are being produced by the College under a grant from the Johnson & Johnson Research Foundation. The film is entitled "Anomalous of the Bile Ducts and Blood Vessels. Structures of the Common Duct," a teaching film of which Dr. Warren H. Cole of Chicago is the author. It is contemplated that there will also be completed in advance of the Clinical Congress at least one additional film which is being produced by the College under the expanded program.

ADVANCE REGISTRATION

The hospitals and medical schools of New York afford accommodations for a large number of visiting surgeons. However in order to insure against overcrowding attendance at the Congress will be limited to the number that can be accommodated at the clinics and meetings. It is therefore expected that surgeons who wish to attend the Congress will register in advance.

Because of greatly increased costs and expenses to which the College will be subjected this year in connection with its New York Clinical Congress the Board of Regents has found it necessary to require a registration fee of \$5.00 for Fellows and for endorsed Junior Candidates. Non-Fellows attending as invited guests of the College will pay a fee of \$10.00. No fee will be required of initiates of the class of 1947.

To each surgeon who registers in advance a formal receipt will be issued. This is to be exchanged for a general admission card upon his registration at headquarters during the Congress.

CLINICAL CONGRESS PROGRAM IN BRIEF

Monday

- 10:00-12:15 General Assembly for Surgeons and Hospital Representatives.
- 1:30- 3:30 Panel Discussion.
- 1:00- 5:00 Clinics, Demonstrations and Clinical Group Conferences, selected local hospitals.
- 1:00- 5:00 Hospital Conference.
- 1:00- 5:00 Surgical Film Exhibition (General)
- 1:00- 5:00 Panel Discussion
- 3:30- 5:00 Presidential Meeting.

Tuesday

- 8:00-12:00 Clinics, Demonstrations and Clinical Group Conferences, selected local hospitals.
- 9:00-12:30 Forum on Fundamental Surgical Problems
- 9:00-10:30 Panel Discussion—Ophthalmology
- 9:30-11:30 Hospital Conference.
- 9:30-11:30 Surgical Film Exhibition (General)
- 10:45-12:15 Panel Discussion—Otorhinolaryngology
- 1:30- 3:00 Panel Discussion.
- 1:00- 5:00 Clinics, Demonstrations—selected local hospitals.
- 1:00- 5:00 Hospital Conference
- 1:00- 5:00 Panel Discussion on Cancer Clinics and Detection Centers.
- 1:00- 5:00 Symposium on Fractures and Other Traumas
- 1:00- 5:00 Surgical Film Exhibition (General)
- 1:00- 4:00 Surgical Film Exhibition (Eye Ear Nose and Throat)
- 3:30- 5:00 Surgical Film Exhibition (Eye Ear Nose and Throat)
- 7:00- 8:00 Hospital Conference.
- 8:00-10:30 Scientific Session General Surgery
- 8:00-10:30 Scientific Session, Ophthalmology
- 8:00-10:30 Scientific Session Otorhinolaryngology

Wednesday

- 8:00- 9:00 Meeting of Cancer Committee.
- 8:00-12:00 Clinics, Demonstrations and Clinical Group Conferences, selected local hospitals.
- 9:00-12:30 Forum on Fundamental Surgical Problems
- 9:00-10:30 Panel Discussion—Ophthalmology
- 9:00-10:30 Hospital Conference.
- 9:30-12:15 Surgical Film Exhibition (General)
- 9:30-12:30 Executive Committees
- 9:30-10:15 Credentials Committees and Committees on Applicants
- 10:15-11:00 Panel Discussion—Otorhinolaryngology
- 10:45-12:15 Meeting of Board of Governors.
- 12:00- 2:00 Meeting of Board of Governors.
- 1:30- 3:00 Panel Discussion.
- 1:00- 5:00 Clinics, Demonstrations and Clinical Group Conferences, selected local hospitals.
- 1:00- 5:00 Symposium on Cancer
- 1:00- 5:00 Surgical Film Exhibition (General)
- 1:00- 4:00 Surgical Film Exhibition (Eye, Ear Nose and Throat)

- 1:00- 5:00 Hospital Conference.
- 3:30- 5:00 Panel Discussion.
- 7:00- 8:00 Surgical Film Exhibition (Eye Ear Nose and Throat)

- 8:00-10:30 Hospital Conference.
- 8:00-10:30 Scientific Session General Surgery
- 8:00-10:30 Scientific Session (Eye Ear Nose and Throat)

Thursday

- 8:00-12:00 Clinics, Demonstrations and Clinical Group Conferences, selected local hospitals.
- 9:00-12:30 Forum on Fundamental Surgical Problems
- 9:00-10:30 Panel Discussion—Ophthalmology
- 9:30-11:30 Surgical Film Exhibition (General)
- 9:30-11:30 Surgical Film Exhibition—Otorhinolaryngology
- 10:45-12:15 Panel Discussion—Governors.
- 1:30- 1:45 Adjourned Meeting, Fellows.
- 1:45- 3:00 Annual Meeting, Fellows.
- 1:00- 5:00 Clinics, Demonstrations and Clinical Group Conferences, selected local hospitals.
- 1:00- 5:00 Hospital Conference.
- 1:00- 5:00 Panel Discussion—Graduate Training in Surgery
- 3:30- 5:00 Panel Discussion
- 3:30- 5:00 Surgical Film Exhibition (General)
- 3:30- 5:00 Surgical Film Exhibition (Eye Ear Nose and Throat)
- 3:30- 5:00 National and Regional Fracture Committees.
- 4:00- 5:00 Committee on the Library
- 7:00- 8:00 Surgical Film Exhibition (Eye Ear Nose and Throat)
- 8:00-10:30 Scientific Session General Surgery
- 8:00-10:30 Scientific Session Ophthalmology
- 8:00-10:30 Scientific Session Otorhinolaryngology

Friday

- 8:00-12:00 Clinics, Demonstrations and Clinical Group Conferences, selected local hospitals.
- 9:00-12:30 Forum on Fundamental Surgical Problems.
- 9:30-10:30 Surgical Film Exhibition (Eye, Ear, Nose and Throat)
- 9:30-12:00 Special Hospital Conference—Point Rating System.
- 10:30-12:00 Surgical Film Exhibition (General)
- 1:30- 5:00 Panel Discussions on each of the following fields, concurrently:
 - Gynecology
 - Obstetrics
 - Plastic Surgery
 - Neurological Surgery
 - Thoracic Surgery
 - Urology
 - Orthopedic Surgery
 - Assembly of Institutes.
- 1:45- 2:15 Assembly of Institutes.
- 2:00- 5:00 Clinics, Demonstrations and Clinical Group Conferences, selected local hospitals.
- 1:00- 5:00 Surgical Film Exhibition (General)
- 3:15-10:00 Convocation

PRELIMINARY PROGRAM—1947 CLINICAL CONGRESS

ASSEMBLY OF INITIATES

Friday 1 45-3 00 p m

IRVIN ABELL, M.D., Louisville Chairman of the Board of Regents, Presiding
The Program of the American College of Surgeons Hospital Standardization Sectional Meetings, Medical Motion Pictures, Library and Literary Research, Graduate Training in Surgery MALCOLM T. MAC
EACHERN, M.D., Chicago Associate Director and Chairman of the Administrative Board
Fellowship in the American College of Surgeons IRVIN ABELL, M.D., Louisville
The Department of Clinical Research of the American College of Surgeons. CHARLES R. BRANCH, M.D.
Chicago, Assistant Director
Qualifications for Fellowship H. P. SAUNDERS, M.D. Chicago, Assistant Director

EVENING SCIENTIFIC SESSIONS

GENERAL SURGERY

Symposia

Tuesday 8 00-10 30 p m

The Proper Use of Blood and Blood Plasma
A Permanent Red Cross Transfusion Service G. FOARD MCGINNIS, M.D. Washington.
Blood Bank Organization. PAUL I. HOXWORTH, M.D. Cincinnati.
Reactions to Blood Transfusion and the Rh Factor LOUIS K. DIAMOND, M.D. Boston.
The Use of Blood and Plasma in Surgery DALLAS B. PERMISTER, M.D. Chicago

Wednesday 8 00-10 30 p m

Fracture Oration. FRANK D. DICKSON, M.D. St. Louis.
Nutritional Requirements in Surgery
Proper Employment of Oral Feeding. EVERETT I. EVANS, M.D. Richmond.
Parenteral Feeding. ROBERT ELMAN, M.D., St. Louis
The Importance of Adequate Supply of Blood and Nourishment for Wound Healing S. CHAMBERLYN, M.D. New Orleans.

Thursday 8 00-10 30 p m

Hypertension
Fundamental Physiological Considerations. PETER HEINBECKER, M.D. St. Louis.
Indications for Surgery in the Treatment of Hypertension. THOMAS FINDLEY, M.D. New Orleans.
Surgical Procedures in the Treatment of Hypertension. REGINALD H. SMITHWICK, M.D. Boston
End Results in the Treatment of Hypertension. CYRUS C. STURGIS, M.D., Ann Arbor

OPHTHALMOLOGY

Tuesday 8 00-10 30 p m

Epithelial Downgrowth Following Cataract Operation. (Speaker to be announced.)
Local Anesthesia in Ophthalmology. WALTER S. ATKINSON, M.D. Watertown, New York.
Operative Treatment of Vertical Tropia. BRITTAIN F. PAYNE, M.D. New York.
Prevention and Management of Operative Complications During Cataract Extraction. JACK S. GUYTON, M.D. Baltimore.

Thursday 8 00-10 30 p m

Prevention of Infection in Eye Surgery. M. HAYWARD POST, M.D., St. Louis
Glaucoma Following Cataract Extraction. WILLIAM C. OWENS, M.D. Baltimore
Retinal Detachment. HARVEY E. THORPE, M.D. Pittsburgh
The Difficult Cataract Extraction. R. TOWNLEY PATON, M.D. New York.

OTORHINOLARYNGOLOGY

Tuesday 8 00-10 30 p m

Bronchiectasis
Relationship of Bronchiectasis to Sinusitis. ROBERT L. GOODALE, M.D. Boston.
The Surgical Aspects of Bronchiectasis. ALTON OCHSNER, M.D. New Orleans.
The Use of Bronchoscopy in Bronchiectasis. FLETCHER D. WOODWARD, M.D. Charlottesville.

Thursday 8:00-10:30 p.m.

Management of Carcinomas of the Larynx

Treatment by Laryngofissure CHEVALIER L. JACKSON M.D. Philadelphia.

Laryngectomy LOUIS H. CLERY M.D., Philadelphia.

Management of Carcinoma of the Larynx with Metastatic Involvement of the Neck. HENRY B. ORTIZ M.D. Newark.

COMBINED SESSION ON OPHTHALMOLOGY-OTORHINOLARYNGOLOGY

Wednesday 8:00-10:30 p.m.

Blood Supply of Eye and Sinuses. OSCAR A. BATSON M.D. Philadelphia.

Dacryocystorhinostomy HAROLD GIFFORD Jr. M.D. Omaha.

Sinus Surgery in Eye Diseases. (Speaker to be announced.)

Ophthalmoneurologic Symptoms of Nasopharyngeal Tumors. FRANK B. WALSH M.D. Baltimore

FORUM ON FUNDAMENTAL SURGICAL PROBLEMS

Tuesday through Friday 9:00 a.m. to 12:30 p.m. - The Waldorf Astoria

Presentation of the results of clinical and experimental research on problems related to general surgery and the surgical specialties which are being currently conducted in many medical schools, clinics, and hospitals.

PANEL DISCUSSIONS

GENERAL SURGERY

Monday 1:30-3:00 p.m.

Pulmonary Suppuration

Moderator EVARIS A. GRAHAM, M.D. St. Louis.

Collaborators BRIAN BLADES, M.D. Washington RICHARD H. OVERHOLT M.D., Brookline, Massachusetts HAROLD NEUFEL M.D. New York.

Monday 3:30-5:00 p.m.

Pancreatitis

Moderator MIMS GAGE, M.D., New Orleans.

Collaborators JOHN M. WAUGH, M.D. Rochester Minnesota HORACE J. MCCORKLE, M.D. San Francisco.

Tuesday 1:30-3:00 p.m.

Surgery of the Spleen

Moderator ALLEN O. WHIFFLE, M.D. New York.

Collaborators GEORGE M. CURTIS, M.D. Columbus, ARTHUR H. BLAKEMORE M.D. New York ROBERT H. E. ELLIOTT M.D. New York LEWIS M. ROUSELOT M.D. New York.

Tuesday 3:30-5:00 p.m.

Jaundice

Moderator CHARLES B. FURSTOW M.D. Chicago.

Collaborators I. S. RAYDON M.D. Philadelphia JAMES T. PRIESTLY M.D. Rochester Minnesota ROSCOE R. GRAHAM, M.D. Toronto.

Wednesday 1:30-3:00 p.m.

Gastric Surgery

Moderator HOWARD K. GRAY M.D., Rochester Minnesota.

Collaborators GEORGE T. PACK, M.D. New York WARREN H. COLE, M.D. Chicago LELAND S. MCKITTRICK M.D. Boston.

Wednesday 3:30-5:00 p.m.

Use of Antibiotic Agents and Chemotherapy in Surgery

Moderator JOHN S. LOCKWOOD M.D. New York.

Collaborators FRANK L. MELNEY M.D. New York C. PHILLIP MILLER, M.D. Chicago HAROLD A. ZINTEL, M.D. Philadelphia Major EDWIN J. POLANSKI, M.C. Fort Sam Houston, Texas.

Thursday 3:30-5:00 p.m.

Surgery of the Hand

Moderator HENRY C. MARRAS, M.D., Boston.

Collaborators HARVEY S. ALLEN M.D. Chicago LAURIE H. MCKIM M.D. Montreal J. HAROLD COUCH, M.D., Toronto.

PRELIMINARY PROGRAM—1947 CLINICAL CONGRESS

NEUROLOGICAL SURGERY

Friday 1 30-5 00 p m

Late Results of Compound Craniocerebral Injuries
 Moderator A. EARL WALKER, M D, Chicago
 Collaborators JAMES C WHITE, M D Boston COBB PILCHER, M D Nashville

OBSTETRICS AND GYNECOLOGY

Friday 1 30-5 00 p m.

Moderator J MASON HUNDLEY JR. M D Baltimore
Lesions in the Urinary System Engendered by Gynecological and Obstetrical Conditions
 Collaborators (To be announced)
Modern Trends in the Treatment of Malignancies of the Female Genitalia
 Collaborators (To be announced)

ORTHOPEDIC SURGERY

Friday 1 30-5 00 p m

Moderator PAUL B MAGNUSON M D Washington
Evaluation of Reconstruction Operations for Ununited Fractures of the Hip
 Collaborators RUDOLPH S REICH M D Cleveland PAUL C COLONNA M D Philadelphia.
Indications and Operative Techniques for Lumbosacral Fusion of the Spine
 Collaborators (To be announced)

PLASTIC SURGERY

Friday 1 30-5 00 p m

Moderator WILLIAM G HAMM M D Atlanta.
Repair of Surface Defects of the Extremities
 Collaborators FRANK McDOWELL, M D St. Louis TRUMAN G BLOCKER, M D Galveston
Major Facial Defects
 Collaborators BRADFORD CANNON M D Boston WILLIAM B DAVIS, M D Baltimore Major AN
 DREW M MOORE M D Phoenixville CARL E. LISCHER, M D St. Louis.

THORACIC SURGERY

Friday 1 30-5 00 p m

Surgery of the Esophagus
 Moderator STUART W HARRINGTON M D Rochester Minnesota
 Collaborators HERMAN J MOERSCH M.D., Rochester Minnesota CARL EGGERS M D New York.

UROLOGY

Friday 1 30-5 00 p m

Moderator CHARLES C HIGGINS, M D Cleveland.
Management of Renal Lithiasis
 Collaborators GEORGE F CAHILL, M D New York LINWOOD D KEYSER, M D Roanoke
Treatment of Carcinoma of the Bladder
 Collaborators HUGH J JEWETT, M.D., Baltimore ARCHIE L. DEAN M D New York EDWARD N
 COOK, M D Rochester Minnesota.

OPHTHALMOLOGY

Tuesday 9.00-10.30 a.m

Surgery of Extracocular Muscles
 Moderator HAROLD W BROWN, M D, New York.
 Collaborators RUDOLF AEBEL, M D New York WALTER H FINK, M D Minneapolis

Surgery of Glaucoma

Wednesday 9.00-10.30 a.m.

Moderator C. S. O'BRIEN M.D. Iowa City

Collaborators P. ROBB McDONALD, M.D. Philadelphia JOHN S. MCGAVIC, M.D. Bryn Mawr WILLIS S. KINGTON M.D., New York.

Angiopathic Ocular Lesions

Thursday 9.00-10.30 a.m.

Moderator (To be announced)

Collaborators WALTER F. DUGGAN M.D. Utica FRANK D. CARROLL, M.D. New York HERMAN ELWYN M.D. New York

OTORHINOLARYNGOLOGY

Tuesday 10.45 a.m.-12.15 p.m.

The Use of Antibiotics in Ear, Nose and Throat Surgery

Moderator CHESTER S. KEETTER, M.D. Boston.

Collaborators WESTLEY M. HUNT M.D. New York FREDERICK T. HILL, M.D. Waterville Maine-LEIGHTON F. JOHNSON M.D. Boston.

Wednesday 10.45 a.m.-12.15 p.m.

Rehabilitation of the Larynx in Bilateral Adductor Paralysis of the Vocal Cords

Moderator GABRIEL TUCKER M.D. Philadelphia.

Collaborators DEGRAAF WOODMAN M.D. New York BRIEN T. KING, M.D., Seattle ALBERT C. FURSTENBERG, M.D. Ann Arbor

Thursday 10.45 a.m.-12.15 p.m.

Anesthesia for Ear, Nose and Throat Surgery

Moderator LLOYD H. MOUSEL, M.D. Washington.

Collaborators (To be announced)

SYMPOSIUM ON FRACTURES AND OTHER TRAUMAS

Tuesday 2.00-5.00 p.m.

ROBERT H. KENNEDY, M.D. New York Chairman Committee on Fractures and Other Traumas, Presiding.
Appraisal of Present Methods of Treatment

Intraosseous Fractures of the Neck of the Femur PAUL C. COLOMBA, M.D. Philadelphia Professor of Orthopedic Surgery University of Pennsylvania School of Medicine.

Fractures of the Upper Extremity of the Tibia Involving the Knee Joint. EDWIN F. CAVE, M.D. Boston Instructor in Orthopedic Surgery Harvard Medical School.

Injuries of the Intervertebral Disc. FRANK H. MATTHEW, M.D. Cincinnati Assistant in Clinical Surgery University of Cincinnati College of Medicine.

Fractures of the Os Calcis. JAMES J. CALLAHAN M.D. Chicago Professor Bone and Joint Surgery Loyola University School of Medicine.

Bone Plates and Screws. ROBERT B. KENNEDY M.D. New York Associate Clinical Professor of Surgery Columbia University College of Physicians and Surgeons.

SYMPOSIUM ON GRADUATE TRAINING IN SURGERY
AND THE SURGICAL SPECIALTIES

Thursday 3.30-5.30 p.m.

Moderator DALLAS B. FREEMAN, M.D. Chicago Professor and Chairman, Department of Surgery Chicago, Surgeon University of Chicago Clinics Chairman Graduate Training Committee American College of Surgeons.

Centralized Plan of Graduate Training in Surgery. MAX M. ZIMMERER, M.D. Cincinnati Professor of Surgery University of Cincinnati College of Medicine

Graduate Training from the Standpoint of Decentralized Residency Training in Hospitals Affiliated with a Medical School. ALBERT C. FURSTENBERG, M.D. Ann Arbor Professor of Otolaryngology Dean, University of Michigan Medical School.

The Place of the Organized Clinic in Graduate Training in Surgery RICHARD B. CATTELL, M.D. Boston Surgeon, Lahey Clinic.

Graduate Training in General Surgery and the Surgical Specialties in a Veterans Hospital. CHARLES B. PUESTOW M.D. Chicago Clinical Professor of Surgery University of Illinois College of Medicine

Discussion Opened by FREDERICK A. COLLIER M.D. Ann Arbor Chairman of the Committee on Relations of the American College of Surgeons with American Boards of Surgery, and FRANK D. GURD M.D. Montreal Professor of Surgery McGill University Faculty of Medicine.

PRELIMINARY PROGRAM—1947 CLINICAL CONGRESS HOSPITAL STANDARDIZATION CONFERENCE GENERAL ASSEMBLY JOINT SESSION—SURGEONS AND HOSPITAL REPRESENTATIVES

Monday 10 00 a.m.—12 30 p.m. (See program on preceding pages.)

PANEL DISCUSSION—CURRENT PROBLEMS IN MEDICAL SERVICE IN HOSPITALS

Monday 2 00—5 00 p.m.—Seri Room—
First Floor—The Waldorf Astoria

Conducted by JOSEPH TURNER, M.D., New York Director
Mount Sinai Hospital.
Integration of the General Practitioner in the Hospital
Medical Staff Organization. HARRY R. MCKELSON,
M.D., Cincinnati President, The Society of General
Physicians.
The Professional Audit to Control Efficiency. FREDERICK
T. HILL, M.D. Waterville, Maine Medical Director
Thayer Hospital.
What is Major and Minor Surgery? Who Should be Per-
mitted to do Major Surgery in an Approved Hospital?
J. J. GOLDBERG, M.D., New York Director Hospital for
Joint Diseases.

Medical Staff Conferences Essential to Medical Progress
and Good Care of the Patient. JOSEPH C. DOANE, M.D.,
Philadelphia, Medical Director Jewish Hospital and
Professor of Clinical Medicine, Temple University
Medical School, University of Pennsylvania.
Moderator. EVERETT W. JONES, Chicago Vice-Pres-
ident, Modern Hospital Publishing Company

8 00—10 30 p.m.—Ballroom—Fourth Floor—
The Waldorf Astoria
Presidential Meeting

Hospital representatives attending the Twenty-Sixth An-
nual Hospital Standardization Conference are most cor-
dially invited to attend the Presidential Meeting

PANEL DISCUSSION—IMPROVING FOOD SERVICE IN HOSPITALS

Tuesday 9 30 a.m.—12 30 p.m.—East Ballroom—
Hotel Commodore

Conducted by MARGARET GILLAM, Chicago Dietary Con-
sultant, American Hospital Association
New Developments in the Field of Nutrition and How They
Affect Food Service and the Care of the Surgical Pa-
tient. ROBERT ELKMAN, M.D. St. Louis, Professor of
Clinical Surgery Washington University School of
Medicine.
New Equipment and Methods to Relieve Problems of
Food Service Conducive to Complaints and Dissatisfac-
tion on the Part of the Patient. EVERETT W. JONES, Chi-

cago Vice-President, The Modern Hospital Publishing
Company
Food Service an Important Factor in Personnel and Public
Relations. PAUL H. PHELPS, Oklahoma City Adminis-
trator University of Oklahoma Hospitals
The Importance of Good Interdepartmental Relations of
the Dietary Department and How They can be Im-
proved. ANTHONY W. ECKERT, Neptune, New Jersey
Administrator Flitkin Memorial Hospital.
Personnel Problems in the Dietary Department. ALLAN E.
MOSSO, New York, Chief Dietitian St. Luke's Hospital
Question and Answer Period
Problems of Food Service in Hospitals

PANEL DISCUSSION—IMPROVING NURSING SERVICE IN HOSPITALS

Tuesday 2 00—5 00 p.m.—Seri Room—
First Floor—The Waldorf Astoria

Conducted by CLAUDE W. MUMFORD, M.D. New York,
Director St. Luke's Hospital and Professor in Hospital
Administration Columbia University
Report of Survey Made by American College of Surgeons
on use of Nurses' Aides. HOWARD C. NAFFZGER, M.D.
San Francisco Professor of Surgery University of Cali-
fornia Medical School Surgeon-in-Chief University
Hospital.
Student Nurse Recruitment—the 1947 Campaign and the
1948 Prospects. MILDRED REES, R.N. Detroit Super-
intendent, Children's Hospital Detroit Chairman Stu-

dent Nurse Recruitment Committee, American Hospital
Association.
Utilization and Training of Practical Nurses and Auxiliary
Workers. ELIZABETH C. PHILLIPS, R.N., Rochester
New York Chairman, Joint Committee on Auxiliary
Nursing Service.
How Hospitals Can Help in Student and Practical Nurse
Recruitment. EMILY K. JOHNSON, New York, Public
Relations Associate, American Nurses Association.
Correlation of the Services of the Graduate Nurse, the
Practical Nurse, and the Nurses Aide. EDWARD M.
BERNECKER, M.D. New York Commissioner Depart-
ment of Hospitals, City of New York.
Question and Answer Period.

JOINT SESSION FOR HOSPITAL TRUSTEES MEDICAL STAFF OFFICERS, AND ADMINISTRATORS

Tuesday 8:00-10:30 p.m. — *Sert Room*—

First Floor—The Waldorf Astoria

RAYMOND P. SLOAN, New York, Editor, *The Modern Hospital*, Presiding.

Statement by the Chairman, RAYMOND P. SLOAN.

Working Together—Hospital Trustees, Members of the Medical Staff and the Administrator Must Co-operate in Assuring Good Care of the Patient in the Hospital. JONAS H. HAYES, New York, Superintendent, Lenox Hill Hospital, President, American Hospital Association. Regionalization of Hospitals. EDWARD J. NOBLE, New

York, Chairman of the Board, American Broadcasting Company and Chairman, Lili Savers Corporation.

The Hospital Trustee Self Analysis—Do I as Trustee Know that my Hospital Lives up to the Standards set down by the American College of Surgeons and Carries out Effectively the Four Primary Functions of the Hospital. WILLIAM HENRY JACKSON, New York, President, New York Hospital.

A New Era in the Education and Training of Hospital Administrators. CLAUDE W. MURPHY, M.D., New York, Superintendent, St. Luke's Hospital, Professor of Hospital Administration, Columbia University.

PANEL DISCUSSION—PERSONNEL RELATIONS AND PUBLIC RELATIONS

Wednesday 9:30 a.m.—12:30 p.m. — *Sert Room*—

First Floor—The Waldorf Astoria

Conducted by FRANK R. BRADLEY, M.D., St. Louis, Director, Barnes Hospital, President, American College of Hospital Administrators.

Better People Make Better Hospitals—Good Person of Relations Can Improve Quality of Personnel. EDGAR C. HAYROW, East Orange, New Jersey, Director, East Orange General Hospital, President Elect, American College of Hospital Administrators.

Personnel Relations Affect Public Relations. OLIVER G. PRATT, Providence; Executive Director, Rhode Island Hospital.

Why Every Hospital Should Have—(a) A Personnel Director and Define Personnel Policies, (b) Some Person Definitely Assigned Over-all Responsibility for Public Relations. FRANK D. MOOREY, M.D., Buffalo, Super-

tendent, Buffalo General Hospital, Associate in Medicine, University of Buffalo School of Medicine.

Orientation and Training of Hospital Personnel. MARY JOHNSON, Ph.D., New York, Research Associate, Program in Hospital Administration, Columbia University. Why Hospitals Must Consciously Enter Competition for the Public's Attention and What Means They Can Ethically Employ. CONNOR M. SMITH, New York, President, WUL, Folsom and Smith.

Round Table Conference on Media for Informing the Public Regarding Hospitals.

Newspapers
Radio
Hospital Publications (c) Tours and Demonstrations
Films and Slides
Forums and Talks

Conducted by JOHN GORRILL, M.D., New York, Associate Professor of Hospital Administration, Columbia University.

PANEL DISCUSSION—IMPROVING MEDICAL RECORDS IN HOSPITALS—JOINT SESSION WITH THE AMERICAN ASSOCIATION OF MEDICAL RECORD LIBRARIANS

Wednesday 2:00-5:00 p.m. — *Sert Room*

First Floor—The Waldorf Astoria

Conducted by ROWEN C. BUREKI, M.D., Philadelphia, Director of Hospitals, University of Pennsylvania, Dean, Graduate School of Medicine.

A Message from the President of the American Association of Medical Record Librarians. EDNA C. BLACK, R.R.L., New Haven, Medical Record Librarian, Grace Unit, Grace-New Haven Hospital; President of the American Association of Medical Record Librarians.

The Present Status of Training Medical Record Librarians Through—

(a) Approved Schools. EDNA K. HOFFMAN, R.R.L., Chicago, Chief Medical Record Librarian, Wesley Memorial Hospital, Director, Program in Medical Record Science, Northwestern University.

(b) In Service Training Institutes. MARGARET C. TAYLOR, R.R.L., Chicago, Field Instructor, In-Service

Extension Courses, American Hospital Association. The Problems of the Supply and Demand for Medical Record Librarians in Hospitals. ADALDIE C. HAYDEN, R.R.L., Chicago, Executive Secretary, American Association of Medical Record Librarians.

The Proper Approach to the Maintaining of Adequate Medical Records. MARGARET DUBOIS, M.D., Richmond, Assistant Director, Hospital Division, and Associate Professor of Hospital Administration, Medical College of Virginia School of Medicine.

The Responsibility of the Medical Staff of the Hospital in Maintaining Good Medical Records. MALCOLM T. MACFARLANE, M.D., Chicago, Associate Director, American College of Surgeons.

Impressions of the Field Representative of the American College of Surgeons in regard to Maintaining Adequate Medical Records. REAR ADMIRAL LUCIUS W. JOHNSON, San Diego, Assistant, Hospital Department, Assigned to Pacific Region.

Question and Answer Period.

PRELIMINARY PROGRAM—1947 CLINICAL CONGRESS

A FORUM ON TRENDS IN HOSPITAL ADMINISTRATION NEW IDEAS AND PROCEDURES AND SPECIAL HOSPITAL PROBLEMS

Wednesday 8:00-10:30 p.m.—Sert Room—
First Floor—The Waldorf Astoria

Participation in the Forum on Hospital Trends New Ideas New Procedures and Special Hospital Problems will be on a voluntary basis, that is those having something to

contribute will please communicate with
Dr. Malcolm T. MacEachern, Associate Director
American College of Surgeons Chicago
Discussion Leader LEO M. LYONS, Chicago Director St.
Luke's Hospital
Ten minutes will be allowed each participant.

FORUM ON SPECIAL PROBLEMS

Thursday 9:30 a.m.—12:30 p.m.—Sert Room—
First Floor—The Waldorf Astoria

Coordinators ROSE C. BURKE, M.D. Philadelphia Di-
rector of Hospitals, University of Pennsylvania Dean
Graduate School of Medicine and EVERETT W. JONES,
Chicago Vice-President, The Modern Hospital Publish-
ing Company
Topics for Discussion
The Modern Hospital—a Complete Synchronized Entity
New Developments in Each Group of Departments
that Provide Unified Service to the Patient.
What Has Been Done to Meet the Present Acute Bed
Shortage?
Present Status of Volunteer Workers in Hospitals.
Hospital Trustees Members of the Medical Staff Nurs-
ing Executives and Administrators Must Cooperate in
Better Nursing Relations.

Are We Making Progress in the Care of the Chronically
Ill?
Hospitals and the Cancer Problem—Cancer Clinics and
Cancer Detection Centers.
Newer Services for the Modern Hospital—Physical
Medicine and Geriatrics.
Planned Convalescence and Its Place in the Community
Adjusting Hospital Service to Medical Progress.
Interdepartmental Relations of the Pharmacy How to
Enhance Its Value and Appreciation by other Depart-
ments in the Hospital.
The Expanding Educational Responsibilities of the Ho-
pital.
Proper Use of the Medical Library
Incentives to Hold Employees—Including Retirement
Plans.
Collaborators
(To be listed later)

ROUND TABLE CONFERENCE—SPECIAL PROBLEMS OF THE SMALL HOSPITAL IN MEETING THE STANDARDS OF THE AMERICAN COLLEGE OF SURGEONS

Thursday 2:00-5:00 p.m.—Sert Room—
First Floor—The Waldorf Astoria

Conducted by HARVEY AGNEW, M.D. Toronto Secretary
Canadian Hospital Council Editor of *Canadian Hos-*
pitals

Topics for Discussion
Medical Staff Organi-
zation
Clinical Laboratory
X-ray Service
Medical Records
Nursing Service

Food Service
Pharmacy Service
Personnel Management
Public Relations
Care of Emergencies

Collaborators
ALLAN CRAIG, M.D., New York Hospital Consultant.
JANE S. DAVIS, M.H.A., Niles, Michigan Superintendent,
Pawating Hospital.

EVA H. ERIKSSON, M.H.A., Olean New York Super-
intendent, Olean General Hospital.
EDMUND B. FERNIVAL, M.H.A., Syracuse, Administra-
tor, Syracuse Memorial Hospital.
WILLIAM C. ILLINOIS, White Plains, New York Ad-
ministrator White Plains Hospital.
GEORGE PRICE, Philadelphia Administrator Jewish
Hospital.
MARSHALL L. PICKENS, Charlotte Assistant Secretary
The Duke Endowment.
WILLIAM P. SLOVER, Manchester Connecticut Super-
intendent, Manchester Memorial Hospital.
ISABELLA N. WILLIAMS, Norwich, New York Adminis-
trator Chenango Memorial Hospital.
ROBERT G. WRIGHT, Alexandria Administrator A
lexandria Hospital President, The Hospital Council of
the National Capital Area.

SPECIAL CONFERENCE ON THE POINT RATING SYSTEM

Thursday 8:00-10:00 p.m.—Sert Room—
First Floor—The Waldorf Astoria

A Special Conference on the Point Rating System for Hos-
pitals with Particular Discussion of Evaluation and

Rating of Hospitals Under this system.
Conducted by HARVEY AGNEW, M.D. Toronto Secret-
Canadian Hospital Council, and HENRY G. FARMER, M.
A., M.D. Chicago Assistant, Hospital Department
American College of Surgeons.

PRELIMINARY CLINICAL PROGRAM

CLINICS IN NEW YORK HOSPITALS

Monday

BELLEVUE HOSPITAL—THIRD (NEW YORK UNIVERSITY) SURGICAL DIVISION

Radiology—Demonstrations. (I & K Building, Ground Floor) ISA I. KAYLAN and STAFF. The Radiologic Treatment of Benign and Malignant Superficial Lesions—Irradiation Alone and as an Adjunct to Surgery.

9:00-4:00. **Röntgenology**—Roentgen Demonstrations of Surgical Diseases. LEWIS J. FREEDMAN and STAFF (I & K Building, Ground Floor).

Surgical Lesions of the Small Bowel Roentgenologically Considered. J. BUCKSTEIN.

Surgical Problems of the Chest. P. STRAUSS.

Diagnostic Problems in Osseous Disease. M. ZUKERMAN.

Diagnosis of Renal Surgical Disease. H. ZUKERMAN.

Interesting Neurosurgical Cases. LEWIS J. FREEDMAN, HERBERT LORBER.

BELLEVUE HOSPITAL—FOURTH (NEW YORK UNIVERSITY) SURGICAL DIVISION

30-3:30. **Surgery Specialties**. (Operating Rooms K-5 & K-6).

Children's Surgery—Hernia. PHILIP ALLEN (Operating Room A).

Children's Surgery—Chest. CHARLES W. LESTER (Operating Room B).

Maxillofacial Surgery—Surgical Correction of Prognathism of the Mandible. LEO WINTER (Operating Room C).

Orthopedic Surgical Clinic. ARTHUR KRIDA, JOHN McCARTHY (Bone Room K-6).

BETH ISRAEL HOSPITAL

5:00-5:30. **Otorhinolaryngology**. Clinical Demonstration of Endoscopic Treatment and Results. MAX SOM and STAFF.

5:30-6:00. **Ophthalmology**. GREINER and STAFF.

FLOWER AND FIFTH AVENUE HOSPITALS

100-4:00. **Neurosurgery**. "Slipped Disc" Operation and End-Results. THOMAS I. HOOKER.

4:00-5:00. **Thoracic Surgery**. Trauma to Neck Involving the Mediastinum—or—Mediastinal Tumors. MILTON J. LLOYD.

HARLEM HOSPITAL

5:00-5:30. Symposium on Burns and Plastic Surgery. F. X. THOMAS, J. A. TAMERIN, A. GARDNER and STAFF.

HOSPITAL FOR JOINT DISEASES

9:00-100. **General Surgery**. Operative Clinic: Tendon Transplantation on the Hand. Transpositional Osteotomy at the Hip. LEO MAYER, HENRY MILCH. Follow-up Demonstration.

Result of Hallux Valgus Operation. PAUL LARSEN.

2. (a) Transplantation of Extensor Carpi Ulnaris Tendon to Give Abduction of the Thumb; (b) Meniscectomy of the Temporomandibular Joint; (c) Fracture of Xiphoid-Xiphoidectomy; (d) Osteotomy Fusion of Hip. MICHAEL BURMAN.

See the "Daily Clinical Bulletin" for Final Program.

3. () Slipping of the Femoral Epiphysis and Results by the Use of Internal Rotation Brace; (b) Result of Osteotomy of the Hip Combined with Resection of Femoral Head. HENRY MILCH.

4. (a) Case Illustrating the Results of Tendon Transplantation and Nerve Suture; (b) Cases Illustrating Surgery of the Hand.

5:00-4:00. **General Surgery**. Operative Clinic: Surgery of the Hand. LEO MAYER.

6:00-4:00. **Otorhinolaryngology**. Operative Clinic: Nose and Throat Surgery. L. KLEINFELD.

LYING-IN HOSPITAL

(See New York Hospital)

MANHATTAN EYE, EAR AND THROAT HOSPITAL

5:00-6:00. **Ophthalmology**. Demonstration: Scleral Demonstration. G. BOWACOLLO.

Demonstration. Corneal Grafting Technique on Rabbits. H. M. KATZ.

7:00-8:00. **Otolaryngology**. Demonstration: Bipolar Floor Otectomy and Laminography. W. R. CANNON.

3:00-4:00. **Ophthalmology**. Demonstration. Cases of Cataract Surgery Complicated by Glaucoma. M. A. LESTER.

METROPOLITAN HOSPITAL

5:00-4:00. **Neurosurgery**. Peripheral Vascular Clinic Including Sympathectomy. LOUIS R. KAUFMAN, S. THOMAS OLIVER, ALBERT LEWIS, KENNETH C. FRANK, DAVID SCHERER.

MONTFIORE HOSPITAL

6:00-4:00. **General Surgery**. Nonoperative Clinic: SAXUEL STANDARD and STAFF.

4:00-5:00. **General Surgery**. Nonoperative Clinic: Neoplastic Diseases. DANIEL LASELO.

MOUNT SINAI HOSPITAL

8:30-100. **Gynecology**. Operative and Nonoperative Clinic: (Surgical Amphitheatre).

Parametrial Fixation Operation (F.bergill). Surgical Treatment of Urinary Stricture Incontinence with Testicular Plate. M. A. GOLDBERGER.

Conservative Surgery for Pelvic Endometriosis. JOSEPH GARDNER.

The Value of the Twenty-four Hour Pregnancy Test: A Review of 500 cases. EMANUEL KLEINBERGER.

The Clinical Value of Hystero-graphy. ARTHUR DAVIES.

The Management of the Menopause. ROBERT I. WATSON.

NEW YORK EYE AND EAR INFIRMARY

2:30-3:30. **Otorhinolaryngology**. Nonoperative Clinic: Frontal and Ethmoid Sinusitis—Preoperative and Follow-up.

3:30-5:30. **Otorhinolaryngology**. Nonoperative Clinic: Adenoid Sinusitis—Preoperative and Follow-up. EARL F. LINDEN.

4:00-6:00. **Otorhinolaryngology**. Operative Clinic: Sinus Surgery. STUART L. CRANE.

4:00-6:00. *Otolaryngology* Operative Clinic Surgery of the Antrum.

Ophthalmology Nonoperative Clinic Preoperative Diagnostic Study **BERENS, ROMAN and ASSOCIATES.**

Preoperative and Postoperative Glaucoma Studies. **KNIGHTON ELWYN and ASSOCIATES.**

Plastic Surgery Methods. **HUGHES, COLE and ASSOCIATES**

Special Lenses—Contact, Anisclonic and Telescopic.

The routine clinics of the New York Eye and Ear Infirmary will be held as usual during this period. All Fellows of the American College of Surgeons are cordially invited to attend.

NEW YORK HOSPITAL

9:00-12:00. *Genitourinary Surgery* Demonstration Surgical Anatomy **ERIKST LAMPE.**

1:00- General Surgery Demonstration Surgical Anatomy Detailed Anatomy of Radical Neck Dissection **ERIKST LAMPE.**

2:00- *Otolaryngology* Operative Clinic Reconstruction of the Nose. **ARTHUR PALMER.**

NEW YORK HOSPITAL
LYING-IN HOSPITAL
Lying In Hospital Staff Conference.

NEW YORK ORTHOPEDIC DISPENSARY AND HOSPITAL

8:00- *Orthopedic Surgery* Operative Clinic. **ALAN DE FOREST SMITH and STAFF** (Capacity 16)

1:30- *Orthopedic Surgery* General Orthopedic Clinic **HALFORD HALLOCK and STAFF**
Congenital Club Foot Clinic **JOHN McCauley**

NEW YORK POST GRADUATE MEDICAL SCHOOL AND HOSPITAL

9:00-11:00. *General Surgery* Operative Clinic (Amphitheatre, 6th Floor) Diseases of Gall Bladder and Bile Ducts

11:00-12:00. *General Surgery* Nonoperative Clinic (Erdmann Auditorium) Follow-up Results.

2:00-3:00. *General Surgery* Operative Clinic (Amphitheatre, 6th Floor)

CLINICS IN BROOKLYN—LONG ISLAND HOSPITALS

Monday

PRESBYTERIAN HOSPITAL

1:00-4:00. *General Surgery* Nonoperative Clinic Carcinoma of the Tongue at a General Hospital, Analysis of 100 cases. **JOHN M. HANFORD**

Lymphatic Spread of Carcinoma of the Rectum and Colon **ROBERT S. GRIMOKEL.**

Roentgen Diagnosis of Carcinoma of the Stomach Ross Golden

Extent of Resection of Stomach for Carcinoma, Correlation with Experimental Mucus Transformation. Case Demonstration. **EDWARD L. HOWES**

Chemotherapy of Malignancy with Nitrogen Mustard. **ALFRED GILLINOR**

Surgical Anatomy Demonstration of Autonomic Nerve Supply of the Gastrointestinal Tract. **JOSE FERRER.**

Structure of the Female Perineum. **PHILIP WISEDELL.**

PRESBYTERIAN NEW YORK ORTHOPEDIC HOSPITALS

Fracture Service

1:30-4:00. *Fractures and Traumatic Surgery* Fracture Clinic The Low Back Problem. **SAWYER R. GASTON**
Three, Four and Five Year Hip Fracture Follow-up Results **CHARLES S. NEER.**

ROOSEVELT HOSPITAL

2:00- *Discussion* Post-Graduate Education of the Surgical Residents and Interns. **CHARLES F. STEWART**

3:30- *Fractures and Traumatic Surgery* Traumatic and Reconstructive Surgery of the Hand.

The Early Treatment of Hand Injuries (Emergency Treatment) **CONRAD W. CUTLER.**

The Repair of Finger Tip Injuries. **HENRY A. KROSBURY**

The Temporary Repair of Severed Flexor Tendons of the Fingers. **R. STERLING MULLER**

Reconstructive Surgery of the Hand. **WILLIAM LITTLE**

St. LUKE'S HOSPITAL

8:30-11:00. *General Surgery* Operative Clinic. **WILLIAM MACFEE and STAFF**

11:00-12:00. *General Surgery* Clinical Demonstrations Neurofibromas of Stomach, six cases **JOHN WEST**

Management of Polyps of Colon and Rectum. **PAUL MORTON**

Adenocarcinoma of Colon and Rectum with Metastasis to Ovaries Illustrative cases **WILLIAM BEERY**

Malignant Tumors of the Appendix **STAFFORD WEAVER**

2:00-3:00. *Orthopedic Surgery* Operative Clinic. **MATTHEW CLEVELAND and STAFF**

ST VINCENT'S HOSPITAL

9:00- *General Surgery* Operative Clinic. **RAYMOND P. SULLIVAN JOHN A. LAWLER and GEORGE R. STUART EDWARD DENKEM**

9:00- *Thoracic Surgery* Group Conference Selection of Cases for Thoracoplasty Lobectomy and Pneumectomy **DANIEL MULVHILL**

9:00- *Radiology* Nonoperative Clinic Roentgen Diagnosis of Thoracic Tumors. **WILLIAM W. MAYER and ASSOCIATES.**

10:00- *Neurosurgery* Nonoperative Clinic Follow-up Study of a Series of Hemilaminectomies with Fusion of Spine. **JAMES T. DANIELS, ANTHONY PIRANI.**

2:00- *Pathology* Clinical Pathological Demonstration of Hodgkin's Disease. **ANTHONY ROTTINO JOHN KEATING, WILLIAM F. MEEHAN**

Growth of Tissue Anterior Chamber of the Eye of Mice Display and Demonstration of Systemic Diseases b

Kodachrome Slides.

Display of Fixed Specimens

VETERANS ADMINISTRATION HOSPITAL

1:00- General Surgical Conference. **FREDERIC W. BANCROFT FORDYCE B. ST JOHN ALLEN O. WHIFFLE**

FLOWER AND FIFTH AVENUE HOSPITALS

- 9:00-12:00. A New Operation for Pilonidal Cyst. JOHN HERBLEN. Preoperative and Postoperative Care. LOUIS R. KAUFMAN and WHITEFIELD STAFF.
- 1:00-12:00. Test of Viability of Bowel. JOHN HERBLEN, KURT LANGE, & THOMAS GLASSER.
- Intestinal Obstruction. ROBERT T. CROWLEY
- 2:00-4:00. *Orthopedic Surgery*. ANTHON H. BINGHAM.
- Plastic Surgery. DAVID M. MAYER, CLARENCE R. STRAATMAN, JOHN F. FORD.
- Urology. SPRAGUE CARLTON and STAFF
- Touching Exhibit in Outpatient Department.
- McGregor Orchidectomy. L. P. WEBSTER.
- Fractures. Fracture Treatment—Many Pictures and End-Results—Demonstrations. MILTON J. WILSON and STAFF

GOLDWATER MEMORIAL HOSPITAL—THIRD SURGICAL DIVISION

- 9:00-1:30. *Geriatric Surgery*. Operative Clinic. Refrigeration in Clinical Surgery. ROOSTER.
- Primary Closure in Amputations of Lower Extremity. TORRES.
- Herniorrhaphy in the Aged. STANLEY BROWN.
- Arteriotomy. SCHMATERSON.
- Peritonitis in the Aged. CARR.
- 11:30-12:00. Ward Rounds.
- 12:00-4:30. *Geriatric Surgery*.
- The Treatment of Varicose Ulcers by Ligation of Femoral Vein. KIMMEL.
- Prostatectomy in the Aged. DOUBILET.
- Prostatectomy in the Complicated Case. BERNSTEIN.
- Interesting Urological Conditions in the Aged. STANLEY.
- Intravenous Procaine in Surgery. OPPENHEIM.
- Arteriology. TORRES.
- Combined Lumbar Sympathectomy and Vein Ligation for Peripheral Vascular Disease. SHARROFF.
- 4:30-6:00. Forum on Surgical Investigation by Postgraduate Class of Surgery.

HARLEM EYE AND EAR HOSPITAL

- 8:00-9:00. *Otolaryngology*. Operative Clinic: Tonsillectomies with Medial tonsil enucleator.
- 9:00-10:00. *Ophthalmology and Otorhinolaryngology*. Operative Clinic: Major Eye, Ear, Nose and Throat Surgery.
- 10:00-11:00. *Otorhinolaryngology*. Demonstration: Demonstration of Ear, Nose and Throat Cases.
- 10:00-11:00. *Otorhinolaryngology*. Operative Clinic: Rhinoplasty Surgical Case.
- 12:00-1:00. *Otorhinolaryngology*. Operative Clinic: Lid Plastic.

HARLEM HOSPITAL

- 9:00-12:00. *General Surgery*. Symposium in Lymphogranulosis and Rectal Strictures. Ward Rounds. L. T. WRIGHT, J. G. LEVY and STAFF.
- 10:00-12:00. *Gynecology*. Symposium. H. C. FALK, P. M. MURRAY, and STAFF.
- Operative Clinic in Gynecological Surgery.
- Nonoperative Clinics: (a) Management of Postabortal Infection. (b) Management of Recurrent Salpingitis. (c) Management of Pyosalpinx Complicating Fibroid with End-Results.

HOSPITAL FOR JOINT DISEASES

- 9:00-12:00. *Orthopedic Surgery*. Operative Clinic: Nerve Resection. Painful Arthritis of Hip Joint. ISADORE ZADEK.

Surgical Anatomy. Mechanism of Motion of Thumb

- EMANUEL KAPLAN.
- 2:00-4:00. *Genitourinary Surgery*. Operative Clinic: Hemorrhoids, Fistulas and Benign Adenoma of Rectum. Pilonidal Cyst. Nonoperative Clinic: Lymphogranuloma Venereum. HARRY GOLDMAN.
- 2:00-4:00. *Genitourinary Surgery*. Operative Clinic: Surgery of the Kidneys, Ureter and Bladder. PAUL ACKER.
- 4:00-5:00. *Plastic Surgery*. Operative Clinic: Nasoplasty. Follow-up Clinic: Nasal Lip and Face Plastics. LEO GOLD GLUMER.

HOSPITAL FOR SPECIAL SURGERY

- 8:30-10:00. *Orthopedic Surgery*. Operative Clinic. Children's Service.
- 9:00-10:00. *General Surgical Problems*. BEEHMAN, GRACE, COLEY and STAFF.
- 2:00-5:00. *General Surgical Problems and Plastic Surgery*.

LYING-IN HOSPITAL

(See New York Hospital)

MANHATTAN EYE, EAR AND THROAT HOSPITAL

- 9:00-10:00. *Ophthalmology*. Demonstration of Anisocoria. Clinic. A. LEVINE.
- 9:00-10:00. *Ophthalmology*. Operative Clinic: Plastic Operations of Eye. BYRON SMITH.
- 9:00-10:00. *Otolaryngology*. Demonstration: Postoperative Cases. M. P. JONES, R. J. BELLROCK.
- 9:30-10:00. *Ophthalmology*. Demonstration, Glaucoma Clinic: Late Results of Glaucoma Surgery. F. L. F. KORN.
- 10:00-11:00. *Ophthalmology*. Demonstration: Corneal Grafting Technique on Rabbit. H. M. KATZ.
- 10:00-11:00. *Otorhinolaryngology*. Operative Clinic and Demonstration: Operation for Polypoid Sinusitis and Demonstration of Postoperative Cases. A. NAGEL.
- 11:30-12:00. *Otolaryngology*. Bronchoscopic Clinic: Diagnosis and Treatment. D. S. CHODURA.
- 12:00-1:00. *Otolaryngology*. Operative Clinic: Fenestration Operation. M. P. JONES.
- 12:00-1:00. *Ophthalmology and Otorhinolaryngology*. Demonstration: Allergy in Ophthalmology. Allergy in Otorhinolaryngology. Demonstration of Cases and Testing Technique. A. A. EGGERTSON, A. B. PAUL.
- 12:00-1:00. *Otolaryngology*. Operative Clinic: Tonsil Surgery. WILLIAM H. TURNLEY.
- 12:00-1:00. *Ophthalmology*. Operative Clinic: Cataract Surgery. D. H. WEBSTER.
- 10:00-11:00. *Ophthalmology*. Demonstration: Corneal Grafting Technique. Corneal Research Laboratory. R. T. PATON, H. M. KATZ.
- 12:00-1:00. *Ophthalmology*. Demonstration: Eye Pathology: Demonstration Microscopic Sections. JOSEPH LAVAL.

MEMORIAL HOSPITAL

- 8:00-10:00. *Tumor Surgery*. Operative Clinics.
- 10:00-12:00. *Tumor Surgery*. Follow-up Clinics in Cancer of the Uterus. TURNLEY.
- 3:00-4:00. *Tumor Surgery*. The Conduct of End Results in Early Cancer Detection Clinic. ELLER L. FARMSTEADT.

METROPOLITAN HOSPITAL

- 9:00-10:00. Intestinal Obstruction. CHARLES A. HALBERSTAM, ROBERT T. CROWLEY.
- 10:00-11:00. *Genitourinary Surgery*. Operative Clinic: Colon Surgery. HAROLD E. CLARK.
- Intestinal Intubation. WALTER L. MICHAELSON.

- 3:00-4:00. *Thoracic Surgery* Operative Clinic. Value of Cavemostomy in Tuberculosis (2 Operations) SAMUEL A. THOMPSON and STAFF
- 3:00-4:00. *Neurosurgery* Operative Clinic. Nerve Suture Cases. THOMAS I. HOEN, IGOR OLJENICK and STAFF

MONTEFIORE HOSPITAL

- 10:00-12:00. *General Surgery* Nonoperative Clinic. Results of Treatment of Hydrocephalus by Choroid Plexectomy. LEO DAVIDOFF
- 3:00-5:00. *General Surgery* Operative Clinic. LEO DAVIDOFF
- 3:00-5:00. *Ophthalmology* Ophthalmological Service. Vitreous Transplantation. S. GARTNER, B. PRIESTLEY. Visual Field Studies in Neurosurgery. M. CHAMLIN. Electroretinography. E. BILLET. Modified Tarsorrhaphy for High Degrees of Exophthalmos. S. GARTNER, M. CHAMLIN. Cataract Surgery in Young Diabetics. A. I. LANCHNER.

MOUNT SINAI HOSPITAL

- 8:30-10:00. *Thoracic Surgery* Operative Clinic (Surgical Amphitheatre). Operation for Patent Ductus Arteriosus. ARTHUR S. W. TOURKOFF
- 10:00-12:00. *Thoracic Surgery* Nonoperative Clinic (Surgical Amphitheatre). Intramuscular Heparin (Concentrated) Therapy in the Prevention of Post-Operative Thrombosis and Embolism. HAROLD NEUFUR. Technique of Operation for Clotted Hemothorax (Motion Picture Demonstration). Results of Operative Treatment of Traumatic Thoracic Lesions in Civilian Practice. ARTHUR S. W. TOURKOFF. Operative Results in Pediatric Surgery. ERNEST E. ARMBRIST. Results of Surgical Treatment of Perforation of the Esophagus. EDWARD A. JENGERM. Results of Conservative Surgical Treatment of Chronic Pulmonary Abscess. IRVING A. SAROT. Late Results in Pulmonary Resection for Carcinoma of the Lung.
- 3:00-5:00. *Ophthalmology* The Surgical Treatment of Glaucoma. JOSEPH LAVAL (Surgical Amphitheatre). Operative and Nonoperative Clinic (Surgical Amphitheatre). Operated Cases. HENRY MENSKY, JOSEPH LAVAL, DAVID WEXLER.

NEUROLOGICAL INSTITUTE

(See Presbyterian Hospital)

NEW YORK EYE AND EAR INFIRMARY

- 10:00-12:00. *Otolaryngology* Nonoperative Clinic. Fenestration—Preoperative and Follow-up. J. M. SMITH.
- 10:00-12:00. *Otolaryngology* Plastic Surgery Preoperative and Follow-up. JAY D. WHITMAN.
- 3:00-5:00. *Otolaryngology* Operative Clinic. Fenestration Operation. J. M. SMITH.
- 3:00-5:00. *Otolaryngology* Operative Clinic. Plastic Surgery. JAY D. WHITMAN.
- P.M.—*Ophthalmology*. Indications for Surgical Interference. KNIGHTON and ELWYN and ASSOCIATES. The Follow-up on Plastic Surgery with Discussion of Further Steps. HUGHES and COLE and ASSOCIATES. Surgical Demonstration with Emphasis on Cataract and Glaucoma Surgery. BERKINS and ROMANIK and ASSOCIATES. X Rays and Localization. SCHWARTZ.

The routine clinics of the New York Eye and Ear Infirmary will be held as usual during this period, all Fellows of the American College of Surgeons are cordially invited to attend.

NEW YORK HOSPITAL

- 9:00—*Thoracic Surgery* Operative and Nonoperative Clinic. FRANK GLENN and STAFF. Surgery of Mediastinal Tumors. WILLIAM DEW ANDRUS. Follow-up Studies of Mediastinal Tumors. JOHN ECKEL. Chronic Constrictive Pericarditis. Medical Aspects. HAROLD STEWART. Chronic Constrictive Pericarditis, Surgical Aspects. WILLIAM DEW ANDRUS. Diagnosis of Carcinoma from Disquamated Cells. GEORGE PAPANTALAO. Clinical Value of Sputum Diagnosis. HENRY CROMWELL, WILLIAM A. BARNES.
- 2:00—*General Surgery* Demonstration. Surgical Anatomy. Anatomy of Hand Involved in Infection and Trauma. ERNEST W. LAMPE.
- 3:00-4:30. *Neurosurgery* Symposium Conducted by BRONKOW S. RAY. Surgical Relief of Intractable Pain of the Head and Neck. HERBERT PARSONS. Oculographic Study of Sensory Pathways. Evidence of Bilateral Conduction. CHARLES BERRY, RICHARD KART, JOSEPH C. HINSKY. Alterations in Visceral Sensation After Thoracolumbar Sympathectomy. CHARLES L. NEILL. Induced Mechanical Stresses in the Analysis of Headache Mechanisms and the Diagnosis of Intracranial Tumors. E. CHARLES KUNKLE. Sympathetic Supply to the Lower Extremities. ARTHUR D. CONSOLE. On the Nature of Hyperalgesia. HAROLD G. WOLFF, JAMES D. HARDY, HELEN GOODRILL. Intracranial Aneurysms. BRONKOW S. RAY.
- 5:00—*Otolaryngology* Operative Clinic. Surgery of the Paranasal Sinuses. SAMUEL F. KELLY.

NEW YORK HOSPITAL

LYING-IN HOSPITAL

- A.M.—*Obstetrics and Gynecology* Operative Clinic. Total Plastic Operation for the Relief of Sterility. J. RANDOLPH GEFFERT. Gynecological Operations. R. GORDON DOUGLAS. Forceps Demonstration. JAMES A. HARRAR.
- P.M.—*Obstetrics and Gynecology* Nonoperative Clinic. Evaluation of Prophylactic Chemotherapy in Cesarean Section. R. GORDON DOUGLAS, ROBERT LANDSMAN. Labor and Delivery Following Cesarean Section. ARTHUR WILSON. Pregnancy Following Salpingostomy. J. RANDOLPH GEFFERT. Studies on Pain During Labor. CARL T. JAVERT, JAMES HARDY. The Conservative Treatment of Endometriosis. ARTHUR V. GREELEY. The Treatment of Massive Hemorrhage. JOHN T. COLE.

NEW YORK ORTHOPEDIC DISPENSARY AND HOSPITAL

- 8:30—*Orthopedic Surgery* Operative Clinic. ALAN DE FOREST SMITH and STAFF.
- 1:30—*Orthopedic Surgery* General Orthopedic Clinic. HALFORD HALLOCK and STAFF.

SURGERY GYNECOLOGY AND OBSTETRICS

FLOWER AND FIFTH AVENUE HOSPITALS
 9:00-10:00. A New Operation for Fibroid Cyst. JOHN
 HERRLIN. Preoperative and Postoperative Care.
 LOUIS R. KAUFMAN and WITFIELD STAFF
 10:00-11:00. Test for Viability of Bowel. JOHN HERRLIN
 KURT LAWEK, S. THOMAS OLSTER.
 Intestinal Obstruction. ROBERT T. CROWLEY
 12:00-4:00. Orthopedic Surgery. ANSON H. BINGHAM.
 Plastic Surgery. DAVID M. MYER, CLARENCE R.
 STRAUBER, JOHN F. FORD.
 Urology. SPRAGUE CARLETON and STAFF
 Teaching Exhibit in Outpatient Department.
 McGREGOR ORCHIDECTOMY. L. P. WERSHUS
 Fracture Treatment—Motion Pictures and
 End Results—Demonstrations. MILTON J. WILSON
 and STAFF

GOLDWATER MEMORIAL HOSPITAL—THIRD SURGICAL DIVISION

9:00-11:30. *Geriatric Surgery* Operative Clinic.
 Refrigeration in Clinical Surgery. RUSSO
 Primary Closure in Amputations of Lower Extremity
 TORSIA.
 Hemorrhaphy in the Aged. STANLEY BROWN
 Arterectomy. SCHMIDTKE
 Peritonitis in the Aged. CASE.
 11:30-12:00. Ward Rounds.
 2:00-4:00. *Geriatric Surgery*
 The Treatment of Varicose Ulcers by Ligation of Fem-
 oral Vein. KLEINER
 Proctitis in the Aged. DOUBILET
 Prostatectomy in the Complicated Case. BERKSTEIN.
 Interesting Urological Conditions in the Aged. SLAVUS.
 Intravenous Procaine in Surgery. OPPENHEIM.
 Arteriography. TORRESA.
 Combined Lumbar Sympathectomy and Vein Ligation
 for Peripheral Vascular Disease. SEAROWITZ
 4:30-
 Forum on Surgical Investigation by Postgrad-
 uate Class of Surgery

HARLEM EYE AND EAR HOSPITAL

8:00-9:00. *Otolaryngology* Operative Clinic—Tonsillecto-
 mies with Medial tonsil emulsor
 9:00-10:00. *Ophthalmology and Otorhinolaryngology* Oper-
 ative Clinic. Major Eye, Ear, Nose and Throat Surg-
 ery
 10:00-11:00. *Otorhinolaryngology* Demonstration Dem-
 onstration of Ear, Nose and Throat Cases
 11:00-12:00. *Otorhinolaryngology* Operative Clinic
 Rhinoplastic Surgical Cases.
 1:00-2:00. *Otorhinolaryngology* Operative Clinic. Lid
 Plastic.

HARLEM HOSPITAL

9:00-10:00. *General Surgery* Symposium on Lympho-
 glands and Rectal Structures. Ward Rounds. L.
 WEINSTEIN, J. G. LEVY and STAFF
 10:00-11:00. *Gynecology* Symposium. H. C. FALK, P. M.
 MURRAY, and STAFF
 Operative Clinic in Gynecological Surgery
 Nonoperative Clinics (a) Management of Postabortal
 Infection (b) Management of Recurrent Salpingitis
 (c) Management of Pyosalpinx Complicating Fibroid
 with End-Results.

HOSPITAL FOR JOINT DISEASES

9:00-10:00. *Orthopedic Surgery* Operative Clinic. Nerve
 Resection for Painful Arthritis of Hip Joint. ISADORE
 ZADEK.

Surgical Anatomy. Mechanism of Motion of Throat
 EMANUEL KAPLAN
 12:00-4:00. *Genitourinary Surgery* Operative Clinic. Hem-
 orrhoids. Fistulas—Anal. Benign Adenoma of Rectum
 Fibroid Cyst. Nonoperative Clinic. Lymphogranu-
 loma Venereum. HARRY GOLDMAN.
 1:00-4:00. *Genitourinary Surgery* Operative Clinic. Sur-
 gery of the Kidneys, Ureter and Bladder. PAUL ANCH-
 WER.
 10:00-12:00. *Plastic Surgery* Operative Clinic. Rhinoplasty
 Follow-up Clinic. Nasal, Lip and Face Plastics. LEO
 GOLDENBAUM.

HOSPITAL FOR SPECIAL SURGERY

8:30-10:00. *Orthopedic Surgery* Operative Clinic. Chil-
 dren Service.
 10:00-11:00. *General Surgical Problems*. BRENNAN GRACE,
 COLLEY and STAFF
 10:00-5:00. *General Surgical Problems and Plastic Surgery*

LYING-IN HOSPITAL (See New York Hospital)

MANHATTAN EYE, EAR AND THROAT HOSPITAL

9:00-
 Clinic. A. LINTAS.
 10:00-
Ophthalmology Demonstration of Anisokonia
 Operations of Eye. BYRON SMITH.
 10:00-
Otolaryngology Demonstration Postopera-
 tive Cases. M. F. JONES, R. J. BULLOCK.
 9:30-
 Clinic. KOCKE.
 Late Results of Glaucoma Surgery. F. L. P.
 10:00-
Ophthalmology Demonstration. Corneal
 Grafting Techniques on Rabbits. H. M. KATZ.
 10:00-
Otorhinolaryngology Operative Clinic and
 Demonstration. Operation for Polypoid Sinusitis and
 Demonstration of Postoperative Cases. A. NORD-
 11:30-
Otolaryngology Bronchoscope Clinic: Diag-
 nosis and Treatment. D. S. COHEN.
 12:00-
Otolaryngology Operative Clinic: Prostati-
 tion Operation. M. F. JONES.
 10:00-
Ophthalmology and Otorhinolaryngology Dem-
 onstration. Allergy in Ophthalmology. Allergy in
 Otorhinolaryngology. Demonstration of Cases and
 Testing Techniques. A. A. EMMETT, A. B. PAUL.
 1:00-
Otolaryngology Operative Clinic: Tonsil-
 Surgery. WILLIAM H. TOWSE.
 12:00-
Ophthalmology Operative Clinic: Cataract
 Surgery. D. H. WERTZ.
 12:00-
Ophthalmology Demonstration. Corneal
 Grafting Techniques. Corneal Research Laboratory.
 R. T. PATON, H. M. KATZ.
 3:00-
Ophthalmology Demonstration. Eye Path-
 ology. Demonstration Microscopic Sections. JONES
 LAVAL.

MEMORIAL HOSPITAL

8:00-10:00. *Tumor Surgery* Operative Clinics.
 10:00-12:00. *Tumor Surgery* Follow-up Clinics in Cancer of
 the Uterus. TOWNLEY
 3:00-4:00. *Tumor Surgery*. The Conduct of End Results
 in Early Cancer Detection Clinic. ELLIS L. FARMER.

METROPOLITAN HOSPITAL

9:00-10:00. Intestinal Obstruction. CHARLES A. HALLER
 STAM, ROBERT T. CROWLEY
 10:00-11:00. *Genitourinary Surgery* Operative Clinic:
 Colon Surgery. HAROLD E. CLARK.
 Intestinal Intubation. WALTER L. MONTGOMERY.

- 2:00-4:00. *Thoracic Surgery* Operative Clinic Value of Cavernostomy in Tuberculosis (2 Operations) SAMUEL A. THOMPSON and STAFF
- 2:00-4:00. *Neurosurgery* Operative Clinic Nerve Suture Cases. THOMAS I. HOWE, IGOR OLJENETSK and STAFF

MONTEFIORE HOSPITAL

- 10:00-12:00. *General Surgery* Nonoperative Clinic: Results of Treatment of Hydrocephalus by Choroid Plexectomy LEO DAVIDOFF
- 2:00-3:00. *General Surgery* Operative Clinic. LEO DAVIDOFF
- 3:00-5:00. *Ophthalmology* Ophthalmological Service Vitreous Transplantation. S. GARTNER, B. PRITZLEY Visual Field Studies in Neurosurgery M. CREAMLIN Electroretinography E. BILLET Modified Tansoraphy for High Degrees of Exophthalmos S. GARTNER, M. CREAMLIN Cataract Surgery in Young Diabetics. A. I. LANCINGER

MOUNT SINAI HOSPITAL

- 8:30-10:00. *Thoracic Surgery* Operative Clinic (Surgical Amphitheatre) Operation for Patent Ductus Arteriosus. ARTHUR S. W. TOUROFF
- 10:00-12:00. *Thoracic Surgery* Nonoperative Clinic (Surgical Amphitheatre) Intramuscular Heparin (Concentrated) Therapy in the Prevention of Post-Operative Thrombosis and Embolism. HAROLD NEUBOF Technique of Operation for Clotted Hemothorax (Motion Picture Demonstration) Results of Operative Treatment of Traumatic Thoracic Lesions in Civilian Practice. ARTHUR S. W. TOUROFF Operative Results in Pediatric Surgery. ERNEST E. AKERHED Results of Surgical Treatment of Perforation of the Esophagus. EDWARD A. JEWERLIN Results of Conservative Surgical Treatment of Chronic Pulmonary Abscess. IRVING A. SAROT Late Results in Pulmonary Resection for Carcinoma of the Lung.
- 2:00-5:00. *Ophthalmology* The Surgical Treatment of Glaucoma. JOSEPH LAVAL (Surgical Amphitheatre) Operative and Nonoperative Clinic (Surgical Amphitheatre) Operated Cases. HENRY MINOFF, JOSEPH LAVAL, DAVID WEXLER.

NEUROLOGICAL INSTITUTE

(See Presbyterian Hospital)

NEW YORK EYE AND EAR INFIRMARY

- 10:00-12:00. *Otolaryngology* Nonoperative Clinic Fenestration—Preoperative and Follow up. J. M. SMITH
- 10:00-12:00. *Otolaryngology* Plastic Surgery Preoperative and Follow-up. JAY D. WHITMAN
- 2:00-5:00. *Otolaryngology* Operative Clinic Fenestration Operation J. M. SMITH
- 2:00-5:00. *Otolaryngology* Operative Clinic Plastic Surgery JAY D. WHITMAN
- P.M.—*Ophthalmology* Indications for Surgical Interference. KIRKSTON and ELWIN and ASSOCIATES. The Follow-up on Plastic Surgery with Discussion of Further Steps. HUGHES and COLE and ASSOCIATES. Surgical Demonstration with Emphasis on Cataract and Glaucoma Surgery. BERENS and ROMADNE and ASSOCIATES. X Rays and Localization. SCHWARTZ.

The routine clinics of the New York Eye and Ear Infirmary will be held as usual during this period, all Fellows of the American College of Surgeons are cordially invited to attend.

NEW YORK HOSPITAL

- 9:00—*Thoracic Surgery* Operative and Nonoperative Clinic. FRANK GLENN and STAFF
- Surgery of Mediastinal Tumors. WILLIAM DEW ANDRU
- Follow up Studies of Mediastinal Tumors. JOHN ECKEL
- Chronic Constrictive Pericarditis Medical Aspects HAROLD STEWART
- Chronic Constrictive Pericarditis, Surgical Aspects. WILLIAM DEW ANDRU
- Diagnosis of Carcinoma from Disquamated Cells. GEORGE PAPANICOLAOU
- Clinical Value of Sputum Diagnosis. HENRY CROW WELLS, WILLIAM A. BARNES
- 2:00—*General Surgery* Demonstration Surgical Anatomy Anatomy of Hand Involved in Infection and Trauma. ERNEST W. LAMPE
- 2:00-4:30. *Neurosurgery* Symposium Conducted by BROOKS S. RAY
- Surgical Relief of Intractable Pain of the Head and Neck. HERBERT PARSONS
- Oscillographic Study of Sensory Pathways Evidence of Bilateral Conduction CHARLES BERRY RICHARD KARL, JOSEPH C. HINSEY
- Alterations in Visceral Sensation After Thoracolumbar Sympathectomy CHARLES L. NEILL
- Induced Mechanical Stresses in the Analysis of Head ache Mechanisms and the Diagnosis of Intracranial Tumors. E. CHARLES KUNDEL
- Sympathetic Supply to the Lower Extremities. ARTHUR D. CONSOLE On the Nature of Hyperalgesia. HAROLD G. WOLFF, JAMES D. HARDY, HELEN GOODSELL
- Intracranial Aneurysms. BROOKS S. RAY
- 2:00—*Otolaryngology* Operative Clinic Surgery of the Paranasal Sinuses. SAMUEL F. KELLY

NEW YORK HOSPITAL

LYING-IN HOSPITAL

- A.M.—*Obstetrics and Gynecology* Operative Clinic Tubal Plastic Operation for the Relief of Sterility J. RANDOLPH GIFFERT
- Gynecological Operations. R. GORDON DOUGLAS. Forceps Demonstration. JAMES A. HARRAL
- P.M.—*Obstetrics and Gynecology* Nonoperative Clinic Evaluation of Prophylactic Chemotherapy in Cesarean Section R. GORDON DOUGLAS, ROBERT LANDESMAN Labor and Delivery Following Cesarean Section ARTHUR WILSON
- Pregnancy Following Salpingostomy J. RANDOLPH GIFFERT
- Studies on Pain During Labor CARL T. JAVERT, JAMES HARDY
- The Conservative Treatment of Endometriosis. ARTHUR V. GRIELEY
- The Treatment of Massive Hemorrhage. JOHN T. COLE

NEW YORK ORTHOPEDIC DISPENSARY AND HOSPITAL

- 8:30—*Orthopedic Surgery* Operative Clinic ALAN DE FOREST SMITH and STAFF
- 1:30—*Orthopedic Surgery* General Orthopedic Clinic HALFORD HALLOCK and STAFF

NEW YORK POST-GRADUATE MEDICAL SCHOOL AND HOSPITAL

- 9:00-12:00. *Neurosurgery* Operative Clinic (Amphitheatre, 6th Floor) Follow-up Clinic (Erdmann Auditorium) Patient Illustration.
- 11:00-12:00. *General Surgery* Value of Immediate and Delayed Cholangiography in the Surgical Management of Common Duct Disease Case Illustration (Erdmann Auditorium)
- 12:00-1:00. *General Surgery* Nonoperative Clinic (Erdmann Auditorium) Follow-up Results in Advanced Common Bile Duct Lesions. Case Illustration.
- 1:00-5:00. *General Surgery* Operative Clinic (Amphitheatre, 6th Floor)

PRESBYTERIAN HOSPITAL

- 8:00- *General Surgery* Operative Clinic Surgery of the Breast. CURRIEMAN D. HAAGENBOOM and STAFF
- Surgery of the Stomach. RICHARD N. SCHULLINGER, EDWARD L. HOWES, HAROLD D. HARVEY
- 12:00-4:00. *General Surgery* Nonoperative Clinic Certain Essential Features Suggested by 30 Year Follow-up in Carcinoma of the Breast. HILTON ARTHURSON
- The Relation of Chronic Cystic Disease to Carcinoma of the Breast. ARTHUR PERCY SPOTT
- The Problem of Early Diagnosis in Carcinoma of the Breast. CURRIEMAN D. HAAGENBOOM
- Röntgenotherapy of Carcinoma of the Breast in Non-operated Cases and as Preoperative and Postoperative Treatment. MAURICE LORZ
- Surgery Versus Radiation in Carcinoma of the Breast. CURRIEMAN D. HAAGENBOOM

PRESBYTERIAN HOSPITAL BABIES HOSPITAL

- 9:00- *General Surgery* Operative Clinic. STAFF OF THE STAFF
- 11:00- *General Surgery* The Surgical Treatment of Cyanotic Heart Disease. GEORGE H. HENRIKSEN
- 1:00- *General Surgery* Nonoperative Clinic
- Röntgen Findings in Intestinal Obstruction of the Newborn. JOHN CAVY
- Treatment of Acute Hematogenous Osteomyelitis. Comparison of Cases Treated with and without Penicillin. Follow-up. EDWARD B. SELBY
- End Results of Operations for Undescended Testicle. EDWARD N. GOODMAN
- Infantal Hernia in Infancy and Childhood. Indication for Operation. Infancy Follow-up. JOHN M. FRANK

PRESBYTERIAN HOSPITAL NEUROLOGICAL INSTITUTE

- 9:00-12:00. *Neurosurgery* Operative Clinic Cases Pre-viously Shown Clinically at the Tuesday Morning Staff Conference.

PRESBYTERIAN HOSPITAL THE INSTITUTE OF OPHTHALMOLOGY

- 9:00-12:00. *Ophthalmology* Nonoperative Clinics: External Diseases of the Eye. JOHN HUGHES DEWEES and STAFF
- 1:00- *Ophthalmology* Operative Clinic Surgery of the Extraocular Muscles and Intracocular Operations. JOHN HUGHES DEWEES
- Surgical Procedures in Glaucoma and Cataract. ALGER HORN BEVERLY REESE and STAFF

PRESBYTERIAN HOSPITAL SECTION OF OTOLARYNGOLOGY

- 9:00-12:00. *Otolaryngology* Nonoperative Clinic: Hearing Aid Fitting. MILLERED SCHOEN
- 12:00-1:00. *Otolaryngology* Operative Clinic: Endoscopy
- 1:00-5:00. *Otolaryngology* Operative Clinic: Endoscopy
- GEORGE BRIGHTON
- FRANKLIN WOODMAN

PRESBYTERIAN HOSPITAL SLOAN HOSPITAL FOR WOMEN

- 9:00- *Gynecology and Gynecology* Operative Clinic: Repair of Cystocele, Rectocele and Pelvic Floor. B. P. WATSON
- 1:00- *Gynecology and Gynecology* Operative Clinic: Operation for Vesical Incontinence. JOHN H. BORN
- 3:00- *Gynecology and Gynecology* Nonoperative Clinic: Surgical Problems in Sterility. C. L. BERTON
- 5:00- *Gynecology and Gynecology* Nonoperative Clinic: Endocrine Activation of Uterine Tumors. E. T. EAGLE
- 7:00- *Gynecology and Gynecology* Nonoperative Clinic: The Possible Carcinogenic Effect of Estrogens. S. GUY PRO

PRESBYTERIAN HOSPITAL SOLTER UROLOGICAL CLINIC

- 9:00-12:00. *Urology* Nonoperative Clinic: Sclerosing Milium in the Treatment of Genito-Urinary Disease. J. H. BENTON
- The Study of the Effect of Streptomycin on Renal Tuberculosis. Preliminary Report. JOHN K. LATTIMER
- Pathological Classifications of Adrenal Tumors. MARY M. MILLER
- Problems Encountered in the Diagnosis and Treatment of Congenital Anomalies of the Urinary Tract in Infants. JOHN V. RODRIGUEZ, CHARLES T. HAZARD
- 1:00-4:00. *Urology* Operative Clinic: Surgical Operations. GEORGE F. CARRILL and STAFF

PRESBYTERIAN NEW YORK ORTHOPEDIC HOSPITALS

- 9:00-12:00. *Fractures and Traumatic Surgery* Operative Clinic. CLAY RAY McBRAT and STAFF
- 12:00-4:00. *Fractures and Traumatic Surgery* Nonoperative Clinic: Shoulder Clavicle Injuries and Recurrent Shoulder Dislocations. Follow-up Results. H. S. McBRAT
- Results of Open and Closed Treatment of Potts Fractures. B. S. McBRAT

ROOSEVELT HOSPITAL

- 9:00- *General Surgery* Operative Clinic: Cancer of the Breast
- Radical Mastectomy: Results, Presentation of Cases and Illustration. Late Results. WILLIAM C. WHITE and STAFF
- 1:00- *General Surgery* Nonoperative Clinic: The Late Results of Carcinoma of the Thyroid Gland. JAMES E. THOMPSON
- Presentation of Cases Illustrating Interesting and Unusual Fractures. (Illustrations). WILLIAM H. CASE
- Nonunion in Fractures of the Femoral Neck, Case Presentations (Illustrations). M. BECKETT HOWARTH

ST LUKE'S HOSPITAL

- 8:30-1:00. *Genitourinary Surgery* Operative Clinic
GEORGE HOCH and STAFF
- 11:00-1:00. *Orthopedic Surgery* Clinical Demonstration
Pathological Demonstration of Internal Derangement
of Knee Joint with End Results. DAVID BOWWORTH,
EDWARD WINANT
- Trochanteric Fractures of Femur Treatment and End
Results. FRED THOMPSON
- Intracapsular Fractures of Femur Treatment and End
Results. MATTHEW CLEVELAND.
- 2:00-5:00. *Genitourinary Surgery* Clinical Demonstra-
tions Follow-up on War Paraplegics. BORIS PETROFF
- Follow-up on Renal Tumors. JOHN TAYLOR.
- Follow-up on Vesical Neck Obstructions to Abdomino-
perineal Resection. JAMES WAUGH
- Results of Transurethral Resection GEORGE HOCH
(presented by C. H. PLACK)
- Combined Treatment of Transvesical Resection and Ra-
diotherapy of Bladder Tumors. E. CRAIG COATES.
- Renal Rickets. ALLEY
- Bilateral Hydronephrosis and Hydroureter GEORGE
HOCH.

ST VINCENT'S HOSPITAL

- 9:00- *General Surgery* Operative and Nonoperative
Clinic Surgery of Gastric and Duodenal Ulcer
GEORGE R. STUART FRANK J. MCGOWAN J. P.
BRUCKNER.
- 9:00- *General Surgery* Operative Clinic RAYMOND
P. SULLIVAN and ASSOCIATES.
- 9:00- *Neurosurgery* Operative Clinic and Follow-up
Study of the Treatment of Painful Phantom Limb
by Removal of Sensory Cortex. C. G. DE GUTTEREZ
MABONEY
- 2:00- *General Surgery* Round Table Discussion
Acute Pancreatitis. CONSTANCE J. MAQUETRE.
- Reconstruction of Common Bile Duct. RAYMOND P.
SULLIVAN JOHN C. MURPHY
- Follow-up Report on 100 Cases of Fracture of Both
Bones of the Legs. EDWARD V. DENKIN E. R.
EASTON

- 2:00- *Pathology Tissue Culture* Demonstration of
Malignancy Display of Fresh Pathological Material.
Display and Demonstration of System Diseases by
Kodachrome Slides. A. ROTTINO and ASSOCIATES

SLOANE HOSPITAL FOR WOMEN

(See Presbyterian Hospital)

VETERANS ADMINISTRATION HOSPITAL

- 9:00- *General Surgery* Operative Clinic. JOHN E.
SULLIVAN CARLES WEEKS.
- 9:00- *Thoracic Surgery* Operative Clinic. RICHMOND
MOORE, WALTER CRANDALL, AARON HIMMELSTEIN
- 9:00- *Vascular Surgery* Operative Clinic. ERNEST
KRUEGER, FITZ CRAMER.
- 9:00- *Plastic Surgery* Operative Clinic. CLARENCE
R. STRAATMAN, ROBERT CLIFFORD.
- 9:00- *Otorhinolaryngology* Operative Clinic. HENRY
THALER.
- 9:00- *Radiology* Radiotherapy Lymphomas and
Leukemia. BERNARD ROSEWITZ
- 9:30-11:30-Medical Rehabilitation Clinic—Demonstrations.
HARRY KESLER, KARL HARPODER, IRWIN D. STEIN
BERNARD STOLL, JACOB BYER.
- 11:00- *General Surgery* Nonoperative Clinic Cardi-
noma of Pancreas. J. E. SULLIVAN
- 1:30- *Thoracic Surgery* Conference. FRANK BERRY
RICHMOND MOORE, WALTER CRANDALL, AARON HIM-
MELSTEIN and RESIDENT STAFF
- 3:30- *General Surgery* Combined Medico-Chirurgi-
cal Differential Diagnosis of Medical and Surgical
Jaundice. FRANKLIN M. HANOVER, ALLEN O. WHIFFLE
FREDERIC W. BANCROFT, BERNARD STRAUSS, CHARLES
A. FLOOD, JOSEPH POST

EXHIBITS

- | | |
|---------------------------------------|-----------------------|
| Anesthesia Section | Results of Vagotomies |
| Bronchogenic Carcinoma | Pathology Section |
| Review of 600 Cases | Medical Illustrations |
| Intracranial Neoplasms | Laboratory |
| Residency Training | Plastic Surgery |
| Program | Prosthetic Appliances |
| Organization of Surgical
Divisions | |

CLINICS IN BROOKLYN—LONG ISLAND HOSPITALS

Wednesday

BROOKLYN EYE AND EAR HOSPITAL

- 1 M *Ophthalmology* Operative Clinic.
- P M *Ophthalmology and Otolaryngology* Nonopera-
tive Clinic Late Results in Detachment of Retina
Late Results in Cataract Extraction Late Results in
Fenestration Late Results in Dacryocystorhinostomy
Late Results in Ptosis. Motion Picture Demonstration
in Color on Basic Anatomy of the Visual Pathway as
Shown by Animation and Dissection.

CUMBERLAND HOSPITAL

- 9:00-12:30. *General Surgery* Operative Clinic. Gastrecto-
my for Cancer of the Stomach with Discussion of Late
Results. JOHN J. GAINKY and STAFF
- Ward Rounds with Discussion of Surgical Gall Bladder
with Late Results. JOHN A. THOM and STAFF
- Ward Rounds with Discussion of Surgery in Large Bowel
Malignancy. HOWARD T. BLATT.
- Retropertitoneal Teratoma with Slides
- 2:00-5:00. Arteriovenous Fistula. JOSEPH L. ANTON

- Lymphogranuloma Inguinale (Venereum) of Uterus.
Follow-up. SILEX H. POLATZ.
- Thoracic Surgery in General Hospital. WILLIAM H.
FIELD.
- Common Duct Atresia. JOHN A. THOM.
- Congenital Esophageal Atresia. SAUL F. LIVINGSTON
- Traumatic Evisceration with Follow-up. MARTIN LUTZ.

JEWISH HOSPITAL

- 8:00-10:00. *General Surgery* Operative Clinic. HENRY
LOURIA and STAFF and RUDOLPH NISSEN and STAFF
- 10:00-12:00. *General Surgery* Nonoperative Clinic: Culture
and Endotracheal Anesthesia in Poor Risk Patients.
IRVING M. PALLIN.
- Treatment of Postoperative Phlebotrombosis with Sub-
cutaneous Heparin. EDWARD HIRSCH, LEO LOWE.
- Bleeding Nipple. SAUL F. LIVINGSTON.
- Acute Mediastinitis. LEW A. HORNBERG.
- Endorhaphy as Surgical Procedure in the Treatment of
Giant Air Cysts of the Lung. RUDOLPH NISSEN

SURGERY GYNECOLOGY AND OBSTETRICS

External Ophthalmoplegia Associated with Hyperthyroidism. VICTOR WOLOVY
The Diagnosis and Surgical Treatment of Thyroiditis. ARTHUR A. WOLVING

Malignant Tumors of the Thyroid Gland Diagnosis, Management and End-Results. FRANK TELLER
Surgical Management of Goiter. HENRY W. LOVIE
General Surgery. Nonoperative Clinic. T. A. UN
Early Dysphagia of the Hip. Diagnosis and Treatment. M. T. KORYN
The Conservative Management of Slipping of the Upper Femoral Epiphysis. L. S. NELSON
The Use of the Austin Moore Plate and Its Modifications in High Osteotomy of the Femur. B. KOVNER
Reconstruction Key Gliding Mechanism of Upper Extremity. JOSEPH E. MILLER
Composition of Bone in Relation to Blood and Diet. A. E. SOMER
The Application of Laminography to Some Orthopedic Problems. B. S. EPPSTEIN

KINGS COUNTY HOSPITAL

9:00-1:00. Plastic Surgery. Operative Clinics. Cleft Palate. SKIN Graft of Burns. WALTER COCKLEY and Staff
9:00-1:00. Plastic Surgery. Nonoperative Clinic. Presentation of Cases, Ward Walk.
Acute Burns (Lye, Acid, Hot Water Electricity and Fire)
Hump and Saddle Noses
Cleft Lip and Palate
Contracted Scars
Web Fingers
Hemangiomas and Lymphangiomas (Lip)
Jug handle Ears
Depressed Fractures—(a) of Malar Bone (b) of Zygomatic Processes (c) of Infraorbital Ridge (d) Fractures of Mandible with and without Loss of Substance (e) Fractures of Superior Maxilla
Skin Grafts—(1) Split-skin, (2) Tube Grafts
Exhibition of Mouldings Photographs and X-rays of Facial Bone Fractures
Animated Motion Pictures Reconstruction Surgery of the Bones of the Face Cleft Palate Operation
1:00- Plastic Surgery Presentations WALTER COCKLEY
LEY
Experiences in the Treatment of 500 Severe Burns
WALTER COCKLEY
Results of Skin-Grafting in Chronic Leg Ulcers. D. VID
TAPPELEY
Skin-Grafting of Burns JOSEPH CALTAGIRONY
Plastic Procedures

LONG ISLAND COLLEGE HOSPITAL

9:00-1:00. General Surgery. Operative Clinics. Thyroidectomy and Other Procedures. EMIL GOETZMAN and Staff
Chronic Thyroiditis. EMIL GOETZMAN
Role of Thyroidectomy in the Preparation of the Critically Ill Hyperthyroid Patient. ARTHUR GOETZMAN
The Presumptive Case as a Problem in Thyroid Surgery. JAMES J. RUTENBERG
Surgical Treatment of Colon Carcinoma. BENJAMIN CLARKE
Radical Mastectomy for Breast Malignancy—Rodman's Method. GUSTAVO DEL VAL
Spontaneous Rupture of Bile Ducts Following Cholecystectomy

Postoperative Management of Thoracic Surgery Patients. F. K. JONKOV
Externalization of the Pericardial Region for Obstructing Lesions in Infants and Children. ROBERT MARCHEL
(The Departments of Ophthalmology and Otolaryngology will conduct their programs at the Brooklyn Eye and Ear Hospital)

METHODIST HOSPITAL

8:00-1:00. General Surgery. Operative Clinic. DR. H. A. REYNOLDS
General Surgery. Operative Clinic. HOWARD T. LIVINGSTON and Staff
9:00-5:00. Symposium on General Surgery and Specialties
Surgery of the Gastrointestinal Tract in the Newborn. C. D. SWEET
The Meyers Operation for Inguinal Hernia. E. MARTIN

Hyperpyrexia in Surgery. A. LOEBEL
Management of Acute Cholecystitis. H. F. GRAHAM
Acute Pancreatitis—A Ten Year Survey. M. CANNON
Supracondylar Fractures of Humerus. H. P. LARSEN
Follow-up on Unusual Genitourinary Cases. H. T. LAWRENCE
Tuberculosis of the Kidney. R. MITCHELL
Care of Genitourinary Tract in Paraplegia. O. P. SCHROEDER
Thoracoabdominal Injuries. E. MARTINOV
Demonstration of Pathology. J. HOFFER
Demonstration of X-rays. G. W. CHASE

ST. JOHN'S HOSPITAL

9:00-1:00. General Surgery. Operative Clinic. Thyroidectomy. Toxic Diffuse Goiter. Patient Prepared for Prophylactic Subtotal Gastric Resection for Duodenal Ulcer
8:00-1:00. Gynecology. Operative Clinic. Manchester Pothrell Operation. Vaginal Hysterectomy
9:00-5:00. Nonoperative Clinic
Demonstration of Unusual X-ray Findings and Problems in Diagnosis—Informal Discussion
Demonstration of Unusual Gross Pathological Specimens—Informal Discussion
Ward Rounds—Gynecology
Surgery of the Hand, Gastrointestinal Surgery
Orthopedic Surgery
Luncheon in the Main Dining Room as Guests of the Hospital
10:40-11:00. Round Table Discussion
The Present Status of Prophylactic Use in Toxic Goiter
MICHAEL N. FOOT
Open Surgery Resection for Carcinoma of the Duodenum
the Bladder as a Treatment of Choice—End-Results
A. HARRIS
The Clinical Application of Cardiopulmonary Physiology in Thoracic Surgery. ELIOT JONKOV
Evaluation of Therapeutic and Diagnostic Para-aortic Block
Vascular Diseases of the Extremities. LEO WATTS
Surgical Lesions of the Hand. Follow up Results. GEORGE B. RUTZ
(1) Postpartum Eclampsia Associated with Hydatidiform Mole—End-Results (2) Geriatric Nephroblastoma—End-Results (3) Geriatric Nephroblastoma—End-Results. CHARLES MITCHELL
ROBERT WARREN ARTHUR MITCHELL
The Value of Detergent (Arumol O.T.) in Antiseptic Therapy. E. J. GRACE

CLINICS IN NEW YORK HOSPITALS

Thursday

BABIES HOSPITAL
(See Presbyterian Hospital)

BELLEVUE HOSPITAL—FIRST

(COLUMBIA UNIVERSITY) SURGICAL DIVISION
8:00—12:00. *Thoracic Surgery* Operative Clinic. (Operating Rooms C and D 5th floor) FRANK B. BERRY and STAFF

2:00—4:30. *Thoracic Surgery* Nonoperative Clinic (I & K Building, Stewart Amphitheatre) FRANK B. BERRY and STAFF

Supportive Diseases of the Lung. WALTER B. CRANDALL.
Cardiopulmonary Physiology. RICHARD RILEY AARON HINDOLSTEN

Surgery of Tuberculosis. JOHN MAXWELL CHAMBERLAIN
Surgical Treatment of Chronic Spontaneous Pneumothorax. HERBERT C. MAIER

Carcinoma of the Lung. ADRIAN LAMBERT

BELLEVUE HOSPITAL—THIRD (NEW YORK UNIVERSITY) SURGICAL DIVISION

8:00—10:00. *General Surgery* Operative Clinics (Operating Rooms K 3 and K-6 Psychiatric Surgical Operating Room) JOHN H. MULLIGAN and STAFF

Thyroidectomy. JOHN A. LAWLER (Operating Room A)
Anterior Resection of the Rectum for Carcinoma. SAMUEL STANDARD (Operating Room B)

Section of Splincter of Oddi for Pancreatitis. JOHN MULLIGAN, HENRY DOUBILET (Operating Room C)
Lumbar Sympathectomy for Peripheral Vascular Disease. WALLACE B. MURPHY (Operating Room D)

Murray-Brackett Osteotomy for Unilateral Fracture of Neck of Femur. IRWIN S. SMITH (Bone Room K-6)
Bope Graft for Ununited Fracture of Tibia. IRWIN S. SMITH (Bone Room K-6)

Thoracolumbar Sympathectomy for Hypertension. HIRSHY M. WEINSTEIN (Psychiatric Surgical Operating Room 7)

10:30—1:00. *General Surgery* Nonoperative Clinics (I & K Building, Stewart Amphitheatre)
Results of Section of Splincter of Oddi for Pancreatitis. HENRY DOUBILET

Role of Sulfadiazine in Thyrotoxic Patients. JOHN A. LAWLER

Results and Follow-up in Carcinoma of the Rectum Treated with Anterior Resection. SAMUEL STANDARD

Pulmonary Complications in Surgery. WALTER CRANDELL

Fluid Compartments in Depleted Surgical Patients and Changes During Repletion. CO. TUL

General Principles of Reconstructive Plastic Surgery of the Face. JOHN M. CONVERSE

Program of Postgraduate Training in Surgery at New York University College of Medicine. JOHN H. MULLIGAN

A.B.L. *Radiology*—Demonstrations (I & K Building, Ground Floor) Treatment of Carcinoma of the Cervix. ISA I. KAPLAN and STAFF

8:00—12:00. *Anesthesia*. Demonstration (C & D Operating Rooms, 5th Floor C & D Building) Anesthesia in Thoracic Surgery. E. A. ROSENBERG and STAFF

8:30—12:00. *Gynecology* Operative Clinic. WILLIAM E. STURGEON and STAFF (K-6 Operating Room)
Total Hysterectomy for Fibroid. CLAUDE E. HEATON

Unusual Cases of Dysmenorrhea in Young Women—A Report of 3 Cases (paper)

Fascial Transplant for Relief of Stress Incontinence in Patients with Previous Operations. WILLIAM E. STURGEON

9:00—10:00. *Radiology* Roentgen Demonstrations of Surgical Diseases. LEWIS J. FRIEDMAN and STAFF (I & K Building, Ground Floor)

Surgical Lesions of the Small Bowel Roentgenologically Considered. J. BUCKSTEIN

Surgical Problems of the Chest. P. STRAUSS
Diagnostic Problems in Osseous Disease. M. ZURROW

Diagnosis of Renal Surgical Disease. H. ZUKERMAN
Interesting Neurosurgical Cases. LEWIS J. FRIEDMAN

HERBERT LONCE
9:00—10:00. *Otorhinolaryngology* Operative Clinic (K-6 Operating Room) Laryngeal Surgery. JOHN F. DALY and STAFF

9:00—10:00. *Anesthesia*. Demonstrations (K-6 Operating Rooms) Therapeutic Nerve Block Clinic. Anesthesia and Shock. E. A. ROSENBERG and STAFF

BETH ISRAEL HOSPITAL

9:00—12:00. *Gynecology* Operative and Nonoperative Clinic. HENRY FALK and STAFF

9:00—10:00. *Anesthesia*. Clinical Demonstrations—Film on Hemorrhage and Shock. S. G. HENSHAW and STAFF

FLOWER AND FIFTH AVENUE HOSPITALS

9:00—11:00. *Anesthesiology* Lumbar Sympathectomy—Technique of Block. S. THOMAS GLASSER. DONALD E. BRACE

11:00—12:00. Hand Infections. JAMES M. WINFIELD, JOHN HERRLIN

General Surgery Diseases of Vascular System. FREDERIC W. BANCROFT

9:00—10:00. Exhibit of Postgraduate School—Regional Iliitis. JOSEPH H. FOWLER

9:00—10:00. Functional Concept of the Internal Ring—Surgical Application in the Repair of Inguinal Hernia—Operating Room or Cadaver. J. CLIFFORD HAYNER

HARLEM HOSPITAL

9:00—12:00. *Trauma Symposium* Ward Rounds. L. T. WRIGHT

Head and Neck Injuries. D. H. SMITH, J. GREENE, S. SHEDDEN

Fractures of the Extremities with Late Results. A. C. LOGAN, W. A. FREEMAN, A. PRIVITERA, C. DI LORINGO

9:00—10:00. *Obstetrical Symposium*. Obstetrical Emergencies. Toxicemia of Pregnancy. F. A. KASDENHORN, A. C. POSNER, J. KURLOCK, M. SCHREIBER, N. PLECHETTE

HOSPITAL FOR JOINT DISEASES

9:00—12:00. *Orthopedic Surgery* Operative Clinic. HARRY SONENSHINE and STAFF

Transcervical Osteotomy for Slipped Femoral Epiphysis. A. KENIG

Femoral Shortening for Inequality of Leg Length. B. J. MINTZ

Nonoperative Clinic Transcervical Osteotomy. A. KENIG

Equalization of Leg Length. B. J. MINTZ
Tendon Transplantation for Radial Nerve Paralysis. H. ALTMAN

- Curvilinear Osteotomy C. SORELL.
 1:00-1:20. *Orthopedic Surgery* Demonstration X Rays of Primary Bone Tumors. MAURICE POMERANCE.
 1:20-1:40. *Ophthalmology* Operative Clinic. Operations in the Eye. JAMES W. SMITH.

HOSPITAL FOR SPECIAL SURGERY

- 8:30-12:00. *General Surgery* Operative Clinic.
 9:00-1:00. *Orthopedic Surgery* Adult Orthopedic Problems.
 1:00-1:20. *Orthopedic Surgery*. Operative and Nonoperative Clinic—Hip Problems.
 Treatment of Fractures of Femoral Neck in the Aged. FREDERICK VON SAAL.
 Trochanteric Arthroplasty. PHILIP D. WILSON.
 Transplantation of External Oblique for Paralysis of Hip Abductors. LOWELL THOMAS, T. CAMPBELL.
 THOMPSON, L. RADWAY STRAUER.
 Treatment of Congenital Dislocation of the Hip with Anterior. FRANCIS CARR.
 Idiopathic Aseptic Necrosis of the Hip in Adults. WILLIAM COOPER.

LYING-IN HOSPITAL

(See New York Hospital)

MANHATTAN EYE, EAR AND THROAT HOSPITAL

- 9:00-1:00. *Ophthalmology*. Operative Clinic. Cataract Extraction, Corneal Transplant. Dacryocystorhinostomy. G. BONACCIOLO.
 9:00-1:00. *Ophthalmology*. Laboratory Demonstration. Bacteriology of the Eye. F. C. KILL, JR.
 9:00-1:00. *Otolaryngology*. Demonstration. Results in Cases of Arytenoidectomy. J. D. KELLY.
 9:00-1:00. *Ophthalmology and Otolaryngology*. Plastic Surgery Clinic. Conference on End-Results. Lantern Slides and Motion Pictures. J. M. CONVERSE, BYRON SMITH.
 1:00-1:20. *Ophthalmology and Otolaryngology*. Operative Clinic. Plastic Surgery. BYRON SMITH, J. M. CONVERSE.
 1:20-1:40. *Ophthalmology*. Operative Clinic. Corneal Graft. R. T. PATON.
 1:40-2:00. *Ophthalmology*. Demonstration. Vitreous Substitution, Technique and End Results. MARIO FRIZZ.
 2:00-2:20. *Ophthalmology and Otolaryngology*. Radiology Clinic. Radiotherapy in Ophthalmology. Results of Radiation in Laryngeal Tumors. MAURICE LEXER, J. R. FREED, C. OVERADOTT.
 2:20-2:40. *Otolaryngology*. Demonstration. Radiation of Hypertrophied Lymphoid Tissue of Nasopharynx. H. D. TATUM.
 2:40-3:00. *Otolaryngology*. Operative Clinic. Arytenoidectomy Operation. J. D. KELLY.
 3:00-3:20. *Ophthalmology*. Demonstration. Postoperative Corneal Graft Cases. R. T. PATON.

MEMORIAL HOSPITAL

- 9:00-1:00. *Tumor Surgery*. Discussion. Five Year Survivals in Lymphomas and Leucemias. LLOYD F. CRAVER.
 The Use of Newer Nitrogen Mustard Compounds in the Treatment of Lymphomas and Leucemias. JOSEPH BURCHARD.
 Nitrogen Mustard As Palliative Agent in Cancer. DAVID KARNOWSKY.
 The Role of Radioactive Iodine in Thyroid Cancer. JACK TRIMBLE.

- Reasons for Delay in the Diagnosis of Cancer. JOHN E. LEACH, GUY ROBINSON.
 Preoperative and Postoperative Care for Cancer of the Lung. JOHN E. LEACH, HENRY DIAMOND.
 Study of Diagnostic Methods and Treatment of Cancer of the Lung. JOHN S. LADUE.
 The Internist's Role in Cancer. WILLIAM H. LEWIS, JR.
 Metabolic Changes in Cancer. JAMES C. ARNOLD.
 Treatment of Shock. HENRY TATUM.
 1:00-1:30. *Tumor Surgery*. Nonoperative Clinic. Follow up Results in Different Types of Breast Cancer.
 1:30-2:00. *Tumor Surgery*. Follow-up Results in Patients with Metastatic Carcinoma of the Breast with Endocrine Therapy.

METROPOLITAN HOSPITAL

- 9:00-1:00. *General Surgery*. Preoperative and Postoperative Treatment. JAMES M. WYFIELD and STAFF and LOUIS R. KAUFMAN. JOHN HERRLIN, EDWARD J. MCCABE.
 General Discussion.
 Field Balance. JOHN HERRLIN.
 Early Ambulation and Early Exercise. EDWARD J. MCCABE.
 1:00-1:20. *Obstetrics and Gynecology*.
 Interesting Ovarian Tumors. W. B. SILVERMASTER.
 Ectopic Pregnancy with Especial Reference to Posterior Culdocentesis. JOHN E. TAYLOR.
 Orthopedic and Fracture Clinic, Sixth Street Dispensary. Demonstration of End-Results of Injuries to Lower Extremities. MILTON J. WILSON and STAFF.

MONTEFIORE HOSPITAL

- 10:00-1:00. *Thoracic Surgery*. Operative and Nonoperative Clinic. ARTHUR H. ADLER, JESSE KROGH.

MOUNT SINAI HOSPITAL

- 8:30-1:00. *General Surgery*. Operative Clinic. Subtotal Gastrectomy and Infradiaphragmatic Vagotomy for Duodenal Ulcer with Stenosis. RALPH COLE.
 Presentations. Physiologic Differences between Gastric and Duodenal Ulcers. FRANK HOLLANDER.
 A Rational Approach to the Surgery of Juxta-Esophageal Ulcer. LEONARD DUCKERMAN.
 Problems in the Treatment of Gastrojejunocolic Fistula. PERRY KILGORE.
 Follow-up Results in Subtotal Gastrectomy for Gastric and Duodenal Ulcer. STOKES MACLE.
 Indications for Vagotomy in Peptic Ulcer. RALPH COLE.
 1:00-1:20. *Otolaryngology*. Operative and Nonoperative Clinic. Inflammation and Neoplastic Diseases of the Frontal Sinus.
 Carcinoma of the Larynx and Results, Treatment by Radiation Therapy. RUDOLPH KRAMER, MORRIS BROTH, ISIDORE GOLDMAN, JOSEPH DUBIN, SAMUEL ROSEN and STAFF (Surgical Amphitheatre).

NEUROLOGICAL INSTITUTE

(See Presbyterian Hospital)

NEW YORK EYE AND EAR INFIRMARY

- 10:00-1:00. *Otolaryngology*. Demonstration and Discussion. X Ray Techniques Used in Otolaryngology. IRVING SCHWARTZ.
 1:00-1:20. *Ophthalmology and Otolaryngology*. Discussion. Allergy in Eye, Ear, Nose and Throat. HOWARD WESTCOTT.

- 2:00-4:00. *Otorhinolaryngology* Demonstration Equipment Including the Biplanor Fluoroscope in the Bronchoscopic Clinic. MAXWELL D. RYAN
- 3:30-4:30. *Otorhinolaryngology* Demonstration Methods—Allergy

P.M.—*Ophthalmology* Demonstration Postoperative Treatment. MEEK and JOHNSON and ASSOCIATES.

Diagnostic Studies with Special Reference to Muscle Studies. BOYES and ASSOCIATES.

Surgery with Special Reference to Lacrimal Apparatus. PATER and McCLELLAN and ASSOCIATES.

Routine clinics of the New York Eye and Ear Infirmary will be held as usual during this period. All Fellows of the American College of Surgeons are cordially invited to attend.

NEW YORK HOSPITAL

- 9:00—*Plastic and Faciomaxillary Surgery* Operative and Nonoperative Clinic: One Stage Push Back Operation for Congenitally Short Palate.
- Results Following Treatment of Carcinoma of the Head and Neck. Case Presentations. HERBERT CONWAY
- Speech Therapy in Cases of Cleft Palate. E. FREUD.
- End-Results Following Radical Breast Amputation With Split Skin Grafting. CHARLES NEWMARK.
- Adult Tissue Extract in Wound Healing. JAMES DINGWALL.
- 9:00—*Ophthalmology* Operative Clinic. Intracapsular Cataract, Glaucoma Strabismus. JOHN McLEAM and STAFF
- 2:00—*General Surgery* Operative and Nonoperative Clinic. FRANK GLENN and STAFF
- Surgical Treatment of Acute Cholecystitis. FRANK GLENN.
- Pathology of Acute Cholecystitis. N. C. FOOTE.
- Complications of Acute Cholecystitis. S. W. MOORE.
- Diverticulitis of Large Bowel, Follow-up Studies. GARDNER CIZZO.
- Follow-up Studies of Polyps of the Large Intestine. S. W. MOORE.
- Demonstration and Exhibit. Surgical Pathological Laboratory. N. C. FOOTE.
- 2:00—*General Surgery* Demonstration Surgical Anatomy Anatomy Involved in Lumbar and Thoracolumbar Sympathectomy. ERNEST LAMPE.
- 2:00—*Otorhinolaryngology* Nonoperative Clinic. Case Presentations and Postoperative Result. Laryngofissure, Carcinoma of Antrum. Mastoiditis with Petrositis and Meningitis. Acute Frontal Sinusitis with Meningitis. ARTHUR PALMER and ASSOCIATES

NEW YORK HOSPITAL

LYING-IN HOSPITAL

- A.M.—*Gynecology* Operative Clinic: Gynecological Operations. H. J. STAMER.
- P.M.—*Obstetrics and Gynecology* Nonoperative Clinic.
- Late Results in Patients with Recurrent Abortion. CARL T. JAVERT.
- Eclampsia. H. J. STAMER.
- Treatment of Endocervicitis. RALPH W. GAUER.
- X-Ray Pelvimetry. CHARLES M. McLANE.
- Mixed Abortion. FRANK SMITH.

NEW YORK ORTHOPEDIC DISPENSARY AND HOSPITAL

- 9:00—*Orthopedic Surgery* Rounds. End-Result Conference. ALAN DE FOREST SMITH.
- Osteoarthritis of the Hip. FRANK STRECHFIELD.

Slipping of the Upper Femoral Epiphysis. M. B. HOWARTH.

- 1:30—*Orthopedic Surgery* General Orthopedic Clinic
- LEONIDAS A. LANTZOUNIS and STAFF
- Scoliosis Clinic. WILLIAM VON LOCKUM.

NEW YORK POST-GRADUATE MEDICAL SCHOOL AND HOSPITAL

- 9:00-12:00. *Tumor Surgery* Operative and Nonoperative Clinic (Amphitheatre, 6th Floor and Erdmann Auditorium) Problems in Surgery of Tumors of Breast, Head and Neck.
- 2:00-5:00. *Traumatic Surgery* Operative and Nonoperative Clinic (Amphitheatre, 6th Floor and Erdmann Auditorium)

PRESBYTERIAN HOSPITAL

- 8:00—*General Surgery* Operative Clinic: Surgery of the Pancreas. JOHN S. LOCKWOOD, WILLIAM B. PARSONS.
- Surgery of the Spleen. LOUIS M. ROUSSELOT ROBERT H. E. ELLIOTT
- Portacaval Anastomosis. ARTHUR H. BLAKEMORE.
- Resection of Maxilla For Carcinoma. MAURICE J. HICKRY
- 2:00-4:00. *General Surgery* Nonoperative Clinic: Tissue Culture as an Adjunct to Surgery. MARGARET MURRAY
- Phlebograms of the Lower Extremity. DAVID C. BULL.
- Oxidized Cellulose in Surgery. VIRGINIA R. FRANTZ.
- Transfusions and the Rh Factor. JOHN SCUMMER.
- Indications for Portacaval Shunt. ARTHUR H. BLAKEMORE.

PRESBYTERIAN HOSPITAL

BABIES HOSPITAL

- 9:00—*General Surgery* Operative Clinic. Ward Rounds. Members of Staff.
- 2:00—*General Surgery* Nonoperative Clinic.
- Congenital Diaphragmatic Hernia. Follow-up. EDWARD J. DOWMAN
- An Analysis of the Neoplasms in Childhood Encountered at Babies Hospital in the Past Ten Years. DOROTHY H. AMSTERDAM.
- Meconium Ileus. Presentation of Cases. Motion Pictures Illustrating Pathology and Operative Procedure. ROBERT B. HIATT
- Acute Appendicitis in Children. A Comparison of the Last Two Five-year Periods with and without Chemotherapy. EARL C. TAYLOR.

PRESBYTERIAN HOSPITAL

NEUROLOGICAL INSTITUTE

- 9:00-12:00. *Neurosurgery* Operative Clinic: Cases Previously Shown Clinically at the Tuesday Morning Staff Conference.

PRESBYTERIAN HOSPITAL

SLOANE HOSPITAL FOR WOMEN

- 9:00—*Obstetrics and Gynecology* Operative Clinic.
- Total Hysterectomy. E. COLLIER.
- 10:30—*Obstetrics and Gynecology* Operative Clinic.
- Myomectomy. HOWARD C. TAYLOR, JR.
- 2:00—*Obstetrics and Gynecology* Radiology: Implantation of Radium for Carcinoma of the Cervix. JAMES CORSCADEN, S. GORRIGLO.
- 3:00—*Obstetrics and Gynecology* Nonoperative Clinic: Late Follow-up Results in Carcinoma of the Cervix. JAMES CORSCADEN

PRESBYTERIAN-NEW YORK ORTHOPEDIC HOSPITALS

Fracture Service

9:00-1:00. *Fractures and Traumatic Surgery* Operative Clinic.

1:30-4:00. *Fractures and Traumatic Surgery* Nonoperative Clinic. Complicated Elbow Fractures with Follow-up Results. **FREDERICK M. SMITH.**

Replacement of Articular Elements. **STEWART S. HUNACK.**

ROOSEVELT HOSPITAL

9:00- *Gynecology* Operative Clinic. **THOMAS C. PIERCE**, **ARTHUR V. GREGG** and **STAFF**

1:00- *Gynecology* Nonoperative Clinic. The Early Results of Malignancies of the Female Pelvic Organs. Prostate of the Uterus, etc.

3:00- *Gynecology* Operative Clinic. Suprapubic Prostatectomy. **SIMON A. BEISLER** and **STAFF**
Nonoperative Clinic. The Presentation of Patients, Illustrating the Results of Urological Procedures. T. tal Cystectomy With Skin and Sigmoidal Implantation. The Reimplantation of Skin Uterostomies Into the Bowel.

ST LUKE'S HOSPITAL

8:30-1:00. *General Surgery* Operative Clinic. **WILLIAM MACFAR** and **STAFF**

1:00-1:30. *General Surgery* Clinical Demonstrations. Benign Intrathoracic Tumors. **ALEXANDER ADA.**
Follow-up Results of Surgery of Gall Bladder and Bile Ducts. Ten-year Study. **EDWARD DOKOVAN.**
Trends in Cesarean—Technique Anesthesia. **EDWARD BURFORD** and **STAFF**

Management of Hemorrhage for Gastric and Duodenal Ulcers. **ROBERT FRANK.**

1:00-4:00. *Ophthalmology* Operative Clinic. **GUTHRIE FRY** and **STAFF**

4:00-5:00. *Ophthalmology* Clinical Demonstrations. Glaucoma. Results of Operation. **GUTHRIE FRY.**
Extracocular Muscle Surgery. Follow-up Results. **HENRY SMITH.**

ST VINCENT'S HOSPITAL

9:00- *Gynecology and Obstetrics* Operative Clinic. Vaginal Plasticity. Abdominal Hysterectomy. Vaginal Hysterectomy. Cesarean Section. **JOHN McGRATH**, **JAMES P. HENKERT**, **THOMAS E. LAVELL**, **JOSPH E. COLE**, **THOMAS IOWING**, **ROBERT LOWELL**, **JOHN KILGOUR**, **WALTER P. GAGE**

1:00- *General Surgery* Round Table Conference. Use of Transverse Incisions. **JOHN A. LAWLER.**
Malignant Tumors Small Intestine. **CLARENCE P. HOWLEY.**

3:00- *Radiology* Roentgen Diagnosis of Lesions of Small Intestine. Differential Diagnosis of Mechanical and Adynamic Ileus. **WALLACE MAYER** and **ASSOCIATES.**

5:00- *Gynecology and Obstetrics* Round Table Conference. Study of Vaginal Spread for Carcinoma of Cervix. Differential Diagnosis in Cases of Acute Pelvic Pathology. Indications for Cesarean Section. Choice of Operation in Uterine Prolapse. **McGRATH** and **ASSOCIATES.**

5:30- *Pathology* Nonoperative Clinic. Study of Abdominal and Chest Fluids for Evidence of Malignancy. Display of First Pathological Material. Display and

Demonstration of System Diseases by Kodachrome Slides. **A. ROTTINO** and **ASSOCIATES.**

3:00- *General Surgery* Thrombosis and Embolism. **LOUIS F. SANDMAN.**

SLOANE HOSPITAL FOR WOMEN

(See Presbyterian Hospital)

VETERANS ADMINISTRATION HOSPITAL

9:00- *General Surgery* Operative Clinic. **EDWIN SELF**, **DAVID I. PINDER.**

9:00- *Neurosurgery* Operative Clinic. Prefrontal Lobotomy. **JOHN E. SCARFF**, **EDWIN KRIEGER.**

9:00- *Genitourinary Surgery* Operative Clinic. **LOUIS SPRIVACK**, **EDWIN J. DREW.**

9:00- *Plastic Surgery* Operative Clinic. **HENRIET CONWAY**, **CORNELIUS J. KRAMER.**

9:00- *Orthopedic Surgery* Conference. Presentation of End Results—Bon Tumors Bone and Joint Tuberculosis. Presentation of Cases. **PHILIP D. WILSON**, **SYDNEY N. EICHENSOHLT**, **ROBERT PATTERSON**, **FRANK E. STONCHFIELD**, and **RESIDENT STAFF.**

9:30-11:30. *Medical Rehabilitation Clinic.* **HARRY KESLER**, **KARL HARTFELDER**, **LEWIS D. STEIN**, **BERNARD STOLL**, **JACOB BYER.**

1:00- *General Surgery* Nonoperative Clinic. Result of Vagus Resection. **P. K. SUTHER**, **JOHN ECKEL**, **CHARLTON HOLMAN**, **FRANK J. MCGOWAN**, **CHARLES PRIVILEY**, and **RESIDENT STAFF.**

4:00- *Neurosurgery* Nonoperative Clinic. Prefrontal Lobotomy. **JOHN E. SCARFF**, **THOMAS RICKER**, **HELAND L. FLOWERS.**

5:00- *Neurosurgery* Conference. Complications in Frontal Cranioplasties Involving Frontal Sinus. Surgery of the Sympathetic Nervous System for Painful Conditions. Leptomeningeal and Porencephalic Cyst with Increased Intracranial Pressure. Surgical Treatment of Phantom Limb. Compression of the Anterior Pyramidal Tract by Cervical Midline Disc. Lucic Pachymeningitis with Increased Intracranial Pressure. **JOHN E. SCARFF**, **Fritz CHASER**, **E. G. KRIEGER**, **J. LAWRENCE POOL.**

5:30- *Urology* Conference. **ANDREW DEAN**, **LOUIS SPRIVACK**, **FREDERICK SPRIVACK**, **EDWIN J. DREW**, **WILLIAM WHITEHOUSE**, **JOHN K. LATTIMER**, and **RESIDENT STAFF.**

EXHIBITS

Anesthesia Section	Results of Vagus Resection
Bronchogenic Carcinoma	Pathology Section
Review of 600 Cases	Medical Illustrations
Intracranial Neoplasms	Laboratory
Residency Training Program	Plastic Surgery
Organization of Surgical Division	Prosthetic Appliances

WOMAN'S HOSPITAL

8:30- 3:00. *Obstetrics and Gynecology* Treatment of Neoplasms of the Female Genital Tract. Management of Birth Injuries and Uterine Displacements. Diagnosis and Treatment of Obstetric Complications. End-Results of Treatment. These Conditions Will Be Discussed.

During the course of the morning the routine for training of Residents in Gynecology and Obstetrics will be outlined.

The pathologist will give demonstrations of obstetric and gynecologic pathological specimens.

CLINICS IN BROOKLYN—LONG ISLAND HOSPITALS

Thursday

BROOKLYN EYE AND EAR HOSPITAL

- P.M. *Ophthalmology Otolaryngology and Facial Surgery* Late Results in Focomaxillary Surgery Late Results in Laryngectomies. Late Results in Glaucoma Surgery Angioscotometry Exhibit. Motion Picture Demonstration on the Development of the Human Eye as Shown by Animation.
- P.M. *Plastic Surgery* Operative Clinic Nasal.

CUMBERLAND HOSPITAL

- 9:00-12:00. *Fractures and Traumatic Surgery* Pinning for Femur Neck Fracture. LEO FARKE and STAFF
Late Results in Fracture of Femur Neck.
Traumatic Abdomen. JOSEPH I. ANTOV
Ward Rounds with X ray Studies of Various Types of Fractures.
- 1:00-5:00. *Fractures and Traumatic Surgery* Nonunion Late Results and General Discussion JOSEPH NEVINS and STAFF
Ward Rounds with Demonstration of Apparatus in Use. Gadgets and Their Use in Fracture Treatment.
Head Injuries. Late Results. FRANK TURNER

HOUSE OF ST GILES THE CRIPPLE

- 11:00- *Orthopedic Surgery* Abduction Traction Splint for Congenital Dislocation of Hip.
Shoulder Fusion, for Polio Flail Shoulders five year Follow-up. Demonstration of Cases.
Follow up on Shelf Operation for Congenital Dislocation of Hip Presentation of Cases. Recurrent Clubfoot. Demonstration of Cases Following Resection of Head of Talus Plus Transplantation of Anterior Tibial Tendon.
Demonstration of Cases Following Teres Major Transplantation for Obstetrical Palsy

JEWISH HOSPITAL

- 8:00-10:00. *General Surgery* Operative Clinic. PAUL W. ASCHNER and STAFF
General Surgery Operative Clinic. LEO S. SCHWARTZ and STAFF
- 10:00-12:00. *Gynecology and Obstetrics* Nonoperative Clinic.
Intrapelvic Hematomas of Vulva. PAUL PEDOWITZ.
Subcutaneous Heparin in Thromboembolic Disease in Gynecology and Obstetrics. HARRY J. GREENE.
A Study of Pelvic Drive in Obstetrics. EDWIN M. GOLD.
Hyaluronidase and Infertility. CHARLES BIRKENBO.
Failed Forceps. ISADORE DATCHMAN WILLIAM FOMERANCE.
Studies with Gonadogen. SAMUEL A. WOLFE, IRWIN NICHOLS.
- 10:00-12:00. *Gynecology and Obstetrics* Nonoperative Clinic
Diagnosis and Treatment of Solitary Cyst of the Kidney by Aspiration and Injection. ABRAHAM D. SEGAL.
Treatment of Hydrocele by Sclerosing Agents. LOUIS H. BARETZ.
Periostitis and Ostitis Pubis Complicating Urologic Procedures. ZACHARY R. COTTLER SAMUEL PARMAS.
Obstructive Uropathy in Children. PERRY KATZEN.
Serum Acid Phosphatase in the Diagnosis and Management of Carcinoma of the Prostate. ISADORE KIMMEL, PAUL W. ASCHNER.

KINGS COUNTY HOSPITAL

- 8:30- *General Surgery* (Long Island College Surgical Service)
Operative Clinics
Gastric Resection. EDWARD P. DUNN
Large Bowel Resection. CHARLES B. JONES.
For Gall-Bladder Disease. PHILIP E. LEAR.
Ligation of Patent Ductus Arteriosus. JOHN L. MADDEN
- 8:30- *Neurosurgery* Operative Clinic JEFFERSON BROWDER and STAFF
Dorsal Cordotomy for Painful Phantom Foot. E. JEFFERSON BROWDER.
Sympathectomy for Arterial Hypertension. EVERETT CORRADINI.
Capsular Fiber Section for Parkinsonism. E. JEFFERSON BROWDER.
Dorsal Rhizotomy for Spasticity of Cerebral Palsy. FRANK TURNER
- 9:00- *General Surgery* Operative Clinic JOSEPH TENOPPE and STAFF Subject to be Announced
- 9:00- *Thoracic Surgery* Operative Clinic
Segmental Resection of the Lung. LEW A. HOCHBERG

KINGS COUNTY HOSPITAL

LONG ISLAND COLLEGE DIVISION

- 8:30- *General Surgery* Operative Clinics (Operating Pavilion—"B" Building)
Gastric Resection. EDWARD P. DUNN
Large Bowel Resection. CHARLES B. JONES.
Gall Bladder and Common Duct Exploration. PHILIP E. LEAR.
Ligation Patent Ductus Arteriosus. JOHN L. MADDEN
- 1:45- *General Surgery* Nonoperative Clinics (Nurses Amphitheatre)
Diagnosis and Treatment of Lymphogranuloma Venereum, Anus, Rectum, and Colon. CHARLES B. JONES.
Paraduodenal Hernia, Report of Four Cases. PHILIP E. LEAR.
Cosmetic Incision for Excision of Benign Breast Tumors and for Supportive Diseases of the Female Breast. GARTANOT DE YOAKKA.
Tetanus—A Surgical Problem. Experience with Five Hundred Cases in China. PHILLIPS F. GREENE.
Gastrojejunocolic Fistula, Six Case Reports. JOHN L. MADDEN
Follow-up Results in Hip Nailing Operations in Femoral Neck. ARNOLD F. SAMMIS.
- 1:00- *General Surgery* Nonoperative Clinic
Subjects to be Announced.
- 2:00- *General Surgery* Nonoperative Clinic
Diagnosis and Treatment of Lymphogranuloma Venereum of Anus, Rectum and Colon. CHARLES B. JONES.
Paraduodenal Hernia, Report of Four Cases. PHILIP E. LEAR.
Surgical Treatment of Gastrojejunocolic Fistula, Report of Six Cases. JOHN L. MADDEN
Cosmetic Incision for Excision of Benign Tumors of the Breast and for Supportive Mastitis. GARTANOT DE YOAKKA.
End Results in Hip Nailing for Fracture of the Femoral Neck. ARNOLD F. SAMMIS.
Tetanus as a Surgical Problem. PHILLIPS F. GREENE.

PRESBYTERIAN NEW YORK ORTHOPEDIC HOSPITALS

Fracture Service

9:00-12:00. *Fractures and Traumatic Surgery* Operative Clinic.

30-4:00. *Fractures and Traumatic Surgery* Nonoperative Clinic. Complicated Elbow Fractures with Follow-up Results. FREDERICK M. SMITH.
Replacement of Articular Elements. STEPHAN S. HUCKLE.

ROOSEVELT HOSPITAL

9:00-12:00. *Gynecology* Operative Clinic. THOMAS C. PIERCE, ARTHUR V. GIBBLEY and STAFF

12:00-1:00. *Gynecology* Nonoperative Clinic. The Early Results of Malignancies of the Female Pelvic Organs, Prostate of the Uterus, etc.

1:00-2:00. *Gynecology* Operative Clinic. Sepsis, Prostatectomy. SIMON A. BEISLER and STAFF
Nonoperative Clinic. The Presentation of Patients, Illustrating the Results of Urological Procedures. Total Cystectomy With Skin and Sigmoidal Implantation. The Replantation of Skin Ureterostomies Into the Bowel.

ST LUKE'S HOSPITAL

8:30-12:00. *General Surgery* Operative Clinic. WILLIAM MACFARLANE and STAFF

12:00-1:00. *General Surgery* Clinical Demonstrations. Benign Intrathoracic Tumors. ALEXANDER ADAMS. Follow-up Results of Surgery of Gall Bladder and Bile Ducts. Ten Year Study. EDWARD DOROVAN. Trends in Care—Technique. Anesthetics. EDWARD BURDETTE and STAFF

1:00-2:00. *Management of Hemorrhage for Gastric and Duodenal Ulcers*. ROBERT FRANKEL

2:00-4:00. *Ophthalmology* Operative Clinic. GUTENBERG FREY and STAFF

4:00-5:00. *Ophthalmology* Clinical Demonstrations. Glaucoma. Results of Operation. GUTENBERG FREY
Extraocular Muscle Surgery. Follow-up Results. HENRY SHAPIRO.

ST VINCENT'S HOSPITAL

9:00-12:00. *Gynecology and Obstetrics* Operative Clinic. Vaginal Plasticity. Abdominal Hysterectomy. Vaginal Hysterectomy. Cesarean Section. JOHN McGRATH, JAMES P. HICKOK, THOMAS E. LAYELL, JOSEPH E. COHR, THOMAS JOYCE, ROBERT LOWRIE, JOHN KILGUS, WALTER P. GAGE.

12:00-1:00. *General Surgery* Round Table Conference. Use of Transverse Incisions. JOHN A. LAWLER.
Malignant Tumors Small Intestine. CLAUDE P. HOWLEY.

1:00-2:00. *Radiology* Roentgen Diagnosis of Lesions of Small Intestines. Differential Diagnosis of Mechanical and Adynamic Ileus. WALLACE MAYER and ASSOCIATES.

2:00-3:00. *Gynecology and Obstetrics*. Round Table Conference.

Study of Vaginal Spread for Carcinoma of Cervix. Differential Diagnosis in Cases of Acute Pelvic Pathology. Indications for Cesarean Section. Choice of Operation in Uterine Prolapse. McGRATH and ASSOCIATES.

3:00-4:00. *Pathology* Nonoperative Clinic. Study of Abdominal and Chest Fluids for Evidence of Malignancy. Display of First Pathological Material. Display and

Demonstration of System Diseases by Kodachrome Slides. A. ROTTINO and ASSOCIATES.

3:00-4:00. *General Surgery* Thrombosis and Embolism. LOUIS F. SANDMAN

SLOANE HOSPITAL FOR WOMEN

(See Presbyterian Hospital)

VETERANS ADMINISTRATION HOSPITAL

9:00-12:00. *General Surgery* Operative Clinic. EDWIN SELF, DAVID K. PIERCE.

12:00-1:00. *Neurosurgery* Operative Clinic. Prefrontal Lobotomy. JOHN E. SCARFF, ERICH KREIBER.

1:00-2:00. *General Surgery* Operative Clinic. LOUIS SEYACK, EDWIN J. DREW.

2:00-3:00. *Plastic Surgery* Operative Clinic. HERBERT CONWAY, CORNELIUS J. KRAMEL.

3:00-4:00. *Orthopedic Surgery* Conference. Presentation of End-Results—Bone Tumors, Bone and Joint Tuberculosis. Presentation of Cases. PHILIP D. WILSON, SYDNEY N. ENCHENBOWER, ROBERT PATTERSON, FRANK E. STORCHFIELD, and RESIDENT STAFF

4:00-5:00. *Medical Rehabilitation* Clinic. HARRY KESLER, KARL HANFORD, IRWIN D. STEIN, BENJAMIN STOLL, JACOB BEER.

5:00-6:00. *General Surgery* Nonoperative Clinic. R. Velt of Vagus Resection. P. K. SAUER, JOHN ECKEL, CHRISTOPHER HOLMAN, FRANK J. MCGOWAN, CHARLES PRIVITERA, and RESIDENT STAFF

6:00-7:00. *Neurosurgery* Nonoperative Clinic. Prefrontal Lobotomy. JOHN E. SCARFF, THOMAS RAY, HILARIO L. FLOWERS.

7:00-8:00. *Neurosurgery* Conference. Complications in Frontal Cranioplasty Involving Frontal Sinus. Surgery of the Sympathetic Nervous System for Painless Conditions. Leptomenigeal and Porencephalic Cyst with Increased Intracranial Pressure. Surgical Treatment of Phantom Limb. Compression of the Anterior Pyramidal Tract by Cervical Midline Disc. Latent Pachymeningitis with Increased Intracranial Pressure. JOHN E. SCARFF, FRANK CHAMBER, E. G. KREIBER, J. LAWRENCE POOL.

8:00-9:00. *Urology* Conference. ARCHIE DEAN, LOUIS SEYACK, PETER SEYLER, EDWIN J. DREW, WILLIAM WRIGHT, JOHN K. LATTIMER, and RESIDENT STAFF

EXHIBITS

Anesthesia Section	Results of Vagus Resection
Bronchogenic Carcinoma	P. thology Section
Review of two Cases	Medical Illustrations
Intracranial Neoplasms	Laboratory
Residency Training Program	Plastic Surgery
Organization of Surgical Division	Prosthetic Appliances

WOJAN'S HOSPITAL

8:30-10:00. *Obstetrics and Gynecology* Treatment of Neoplasms of the Female Genital Tract. Management of Birth Injuries and Uterine Displacements. Diagnosis and Treatment of Obstetric Complications. End-Results of Treatment of These Conditions Will Be Discussed.

During the course of the morning the routine for training of Residents in Gynecology and Obstetrics will be outlined.

The pathologist will give demonstrations of obstetric and gynecologic pathological specimens.

CLINICS IN BROOKLYN—LONG ISLAND HOSPITALS

Thursday

BROOKLYN EYE AND EAR HOSPITAL

- P.M. *Ophthalmology, Otolaryngology and Faciomaxillary Surgery* Late Results in Faciomaxillary Surgery Late Results in Laryngectomies. Late Results in Glaucoma Surgery Angioscotomy Exhibit. Motion Picture Demonstration on the Development of the Human Eye as Shown by Animation
- P.M. *Plastic Surgery* Operative Clinic Nasal

CUMBERLAND HOSPITAL

- 9:00-12:00. *Fractures and Traumatic Surgery* Pinning for Femur Neck Fracture. LEO FASKE and STAFF
Late Results in Fracture of Femur Neck.
Traumatic Abdomen JOSEPH I. AUSTON
Ward Rounds with X ray Studies of Various Types of Fractures.
- 2:00-5:00. *Fractures and Traumatic Surgery* Nonunion Late Results and General Discussion JOSEPH NEVINS and STAFF
Ward Rounds with Demonstration of Apparatus in Use. Gadgets and Their Use in Fracture Treatment.
Head Injuries. Late Results. FRANK TURNEY

HOUSE OF ST GILES THE CRIPPLE

- 11:00- *Orthopedic Surgery* Abduction Traction Splint for Congenital Dislocation of Hip.
Shoulder Fusion for Polio Flail Shoulders five-year Follow-up Demonstration of Cases
Follow-up on Shell Operation, for Congenital Dislocation of Hip Presentation of Cases. Recurrent Clubfoot, Demonstration of Cases Following Resection of Head of Talus Plus Transplantation of Anterior Tibial Tendon.
Demonstration of Cases Following Teres Major Transplantation for Obstetrical Palsy

JEWISH HOSPITAL

- 8:00-10:00. *General Surgery* Operative Clinic. PAUL W. ASCHNER and STAFF
General Surgery Operative Clinic. LEO S. SCHWARTZ and STAFF
- 10:00-12:00. *Gynecology and Obstetrics* Nonoperative Clinic
Puerperal Hematomas of Vulva. PAUL PEDOWITZ
Subcutaneous Heparin in Thromboembolic Disease in Gynecology and Obstetrics. HARRY J. GREENE
A Study of Pelvic Drive in Obstetrics. EDWIN M. GOLD
Hyaluronidase and Infertility CHARLES BRONKHOFF
"Failed Forceps." ISADORE DAKSHMAN WILLIAM POWERS
Studies with Gonadogen. SAMUEL A. WOLFE, IRWIN NERZIS
- 10:00-12:00. *Gynecology and Obstetrics* Nonoperative Clinic
Diagnosis and Treatment of Solitary Cyst of the Kidney by Aspiration and Injection. ABRAHAM D. SZOAL
Treatment of Hydrocele by Sclerosing Agents. LOUIS H. BARTZ
Peritonitis and Otitis Pubis Complicating Urologic Procedures. ZACHARY R. COTTLER, SAMUEL PARKMAN
Obstructive Uropathy in Children. PERRY KATZKY
Serum Acid Phosphatase in the Diagnosis and Management of Carcinoma of the Prostate ISADORE KIMMEL, PAUL W. ASCHNER

KINGS COUNTY HOSPITAL

- 8:30- *General Surgery* (Long Island College Surgical Service)
Operative Clinics
Gastric Resection. EDWARD P. DUNN
Large Bowel Resection. CHARLES B. JONES
For Gall Bladder Disease. PHILIP E. LEAR.
Ligation of Patent Ductus Arteriosus JOHN L. MADDEN
- 8:30- *Neurosurgery* Operative Clinic JEFFERSON BROWDER and STAFF
Dorsal Cordotomy for Painful Phantom Foot. E. JEFFERSON BROWDER
Sympathectomy for Arterial Hypertension EVERETT CORRADINI
Capsular Fiber Section for Parkinsonism. E. JEFFERSON BROWDER
Dorsal Rhizotomy for Spasticity of Cerebral Palsy FRANK TURNEY
- 9:00- *General Surgery* Operative Clinic. JOSEPH TENORIS and STAFF Subject to be Announced.
- 9:00- *Thoracic Surgery* Operative Clinic
Segmental Resection of the Lung LEW A. HOCHBERG

KINGS COUNTY HOSPITAL

LONG ISLAND COLLEGE DIVISION

- 8:30- *General Surgery* Operative Clinics (Operating Pavilion—"B" Building)
Gastric Resection. EDWARD P. DUNN
Large Bowel Resection CHARLES B. JONES
Gall Bladder and Common Duct Exploration. PHILIP E. LEAR
Ligation Patent Ductus Arteriosus. JOHN L. MADDEN
- 1:45- *General Surgery* Nonoperative Clinics (Nurses Amphitheatre)
Diagnosis and Treatment of Lymphogranuloma Venereum, Anus, Rectum, and Colon CHARLES B. JONES
Paraduodenal Hernia, Report of Four Cases. PHILIP E. LEAR
Cosmetic Incision for Excision of Benign Breast Tumors and for Suppurative Diseases of the Female Breast. GAUTAMU DE YOAKHA
Tetanus—A Surgical Problem. Experience with Five Hundred Cases in China. PHILLIPS F. GREENE
Gastrojejunocolic Fistula, Six Case Reports JOHN L. MADDEN
Follow-up Results in Hip Nailing Operations in Femoral Neck. ARNOLD F. SAMMIE
- 1:00- *General Surgery* Nonoperative Clinic
Subjects to be Announced.
- 1:00- *General Surgery* Nonoperative Clinic.
Diagnosis and Treatment of Lymphogranuloma Venereum of Anus, Rectum and Colon CHARLES B. JONES
Paraduodenal Hernia, Report of Four Cases. PHILIP E. LEAR
Surgical Treatment of Gastrojejunocolic Fistula, Report of Six Cases. JOHN L. MADDEN
Cosmetic Incision for Excision of Benign Tumors of the Breast and for Suppurative Mastitis GAUTAMU DE YOAKHA
End Results in Hip Nailing for Fracture of the Femoral Neck. ARNOLD F. SAMMIE
Tetanus as a Surgical Problem. PHILLIPS F. GREENE

- 800- *Neurosurgery* Nonoperative Clinic:
The Cerebellar Hemangioblastomas. EVERETT COE
RADFORD.
Cysticercosis Disease of the Brain. LESTER REED.
Surgery for Parkinson's Disease. E. JEFFERSON BROWDER.
Management of Fractures of the Spine with Spinal Cord
Damage. FRANK TURKEY.
Subdural Hematoma. RICHARD GRIGGS.
8200- *Thoracic Surgery* Nonoperative Clinic.
Lung Abscess As Seen at the Kings County Hospital.
ALFRED D. BUCHANAN.
Pneumothorax in Cases of Pulmonary Tuberculosis.
EDWIN H. GRIFFIN.
Some Experiences in the Management of Chronic Em-
physema. ELTON K. JOHNSON.
Paradoxical Respiration—Its Causes, Consequences and
Treatment. LEW A. HOCKENRUD.

LONG ISLAND COLLEGE HOSPITAL

- 700- *Obstetrics and Gynecology* Operative and Non-
operative Clinics, and Demonstrations. Members of
the staff.
The Departments of Ophthalmology and Otolaryngology
will conduct their programs at the Brooklyn Eye and
Ear Hospital.

CLINICS IN NEW YORK HOSPITALS

Friday

- BELLEVUE HOSPITAL—FIRST (COLUMBIA
UNIVERSITY) SURGICAL DIVISION
8:00-12:00. *Thoracic Surgery* Operative Clinic (C & D
Building, 5th Floor Operating Room): FRANK B
BERRY and STAFF
BELLEVUE HOSPITAL—THIRD (NEW YORK
UNIVERSITY) SURGICAL DIVISION
8:00-12:00. *Anesthesia*. Demonstration (C & D Operating
Rooms, 5th Floor C & D Building) Anesthesia in
Thoracic Surgery. E. A. ROVENSTOCK and STAFF.
A.M. *Radiology*. Demonstrations (I & K Building,
Ground Floor). IRA L. KAPLAN and STAFF.
Radiation Therapy as an Adjunct Method of Treatment
in Genitourinary Neoplasm. Alternate.
BELLEVUE HOSPITAL—FOURTH (NEW YORK
UNIVERSITY) SURGICAL DIVISION
8:00-9:30. *General Surgery and Fractures*. Operative
Clinics. (Operating Rooms K-5 & K-6) ARTHUR
McQUILLAN and STAFF.
Thyroid Surgery. ARTHUR S. McQUILLAN (Operating
Room A).
Stomach Surgery. J. WILLIAM HINTON (Operating
Room B).
Intestinal Surgery. LESTER BATHURSTACH (Operating
Room C).
Gall-Bladder Surgery. EDWARD V. DENCKEN (Operat-
ing Room D).
Smith-Petersen Nailing for Fracture of Neck of Femur.
KROGH M. LEVIN (Bone Room K-6).
9:00-12:00. *General Surgery and Fractures*. Nonoperative
Clinics (I & K Building, Stewart Amphitheatre,
Ground Floor) End Results. ARTHUR S. McQUILLAN
and STAFF.
Thyroids. ARTHUR S. McQUILLAN.
Peptic Ulcers. J. WILLIAM HINTON.

METHODIST HOSPITAL

- 9:00-12:00. *Obstetrics and Gynecology* Operative Clinics
(Buckley Building—8th Floor).
Vaginal Hysterectomy. Total Hysterectomy. (Other
Operative Procedures to be Scheduled Later). G. H.
DAVIS and STAFF.
9:00-12:00. *Obstetrics and Gynecology* Demonstrations
(Maternity Building—Main Floor).
Ball Technique in X-Ray Menstruation of Pelvis. BETT
LEE GOVARD.
Cord Transfusion. B. MYER.
Inspection of Clinics, Wards and Delivery Rooms.
RESIDENT STAFF.
Maternal Mortality and Morbidity in Obstetrics. SER-
MAN.
100- *Obstetrics and Gynecology* Nonoperative Clinic.
G. H. DAVIS, Chairman.
Fibroids and Ovarian Tumors in Pregnancy. SAMPSON.
Fetal Mortality in Prolonged Labor. GAYSON.
Leiomyosarcoma. Contract with Cellular Myofibroscyo-
mas. FRANK HOWE.
Ablatio Placentae. BELL.
Manual Removal of Placenta. H. MYER.
Anesthesia in Cesarean Section. H. ACHES, JR.
Wedge Resection of Ovary for Polycystic Disease. S. C.
HALL.

- Fracture of the Neck of the Femur. KROGH M. LEVIN.
Stricture of Rectum Due to Lymphogranuloma Ven-
ereum. LESTER BATHURSTACH.
Gall-Bladder Disease. EDWARD V. DENCKEN.

BETH ISRAEL HOSPITAL

- 9:00-12:00. *Orthopedic Surgery*. BALKENWED and STAFF.
12:00-5:00. *Obstetrics*. LARGACK, SCARDIN.

FLOWER AND FIFTH AVENUE HOSPITALS

- 9:00-12:00. Water Balance, etc. FRANCIS D. SPIER, JOHN
HEERLEIN.
Lyophilized Amino Acids. MICHAEL G. MULLER.
Relationship of Amino Acid Composition of Foods.
R. J. BLOCK, H. H. MITCHELL.
100-12:00. The Prevention of Renal Complications by
Therapy with Mixtures of Sulfonamides—or—Phthal-
ylsulfacetamide in Surgery of Colon. DAVID LEHR.
100-3:00. Presentation of Plans for Resident Training in
Surgery. JAMES M. WHITFIELD.

HARLEM HOSPITAL

- 9:00-12:00. Abdominal Catastrophes—Operative and
Nonoperative Clinic and Ward Rounds. B. N. BASS,
A. A. ZIMMERMAN, J. L. WILSON, A. DEL. MATHEW.
12:00-5:00. Clinico-Pathological Conference. L. T.
WRIGHT, S. WEINTRAUB and STAFF.

HOSPITAL FOR JOINT DISEASES

- 9:00-12:00. *General Surgery* Operative Clinic. Carcinoma
of Colon. Carcinoma of Rectum. Nonoperative Clinic.
Intra-Abdominal Rersection with Anastomosis for Car-
cinoma of the Rectum. A. J. BELLER.
100-12:00. *Neurosurgery* Operative Clinic. Operations of
Brain and Spinal Cord. ABRAHAM KAPLAN.

HOSPITAL FOR SPECIAL SURGERY

- 8:30-12:00. *Orthopedic Surgery*. Adult Service.

- 2:00-5:00. *Orthopedic Surgery* Operative and Nonoperative Clinic
 Osteoid Osteoma. MILTON HELPERN RAYMOND LEWIS
 Bone Grafts without Internal Fixation. PETER RIZZO
 Bridging of Defects of Long Bones of the Extremities
 JOHN FLAMAGAN
 The Bone Bank. PHILIP D. WILSON
 Spine Fusion with Internal Fixation. L. RAMSAY
 STRAUSS
 Problems in the Treatment of Scoliosis. JOHN R. COSSA

LYING-IN HOSPITAL
 (See New York Hospital)

MANHATTAN EYE, EAR AND THROAT
 HOSPITAL

- 9:30- *Otolaryngology* Demonstration Audiometry
 Selection and Fitting of Hearing Aids Retraining
 Residual Hearing. WERTHEIMER, NEUMARKER.
 10:00- *Ophthalmology* Demonstration Corneal
 Grafting Technique on Rabbits. H. M. KATZM
 10:00- *Neurosurgery* Operative Clinic. Facial
 Nerve Graft
 Operation and Demonstration of Postoperative Results.
 T. G. TICKLER.
 2:00- *Otolaryngology* Operative Clinic. Tonsil Sur-
 gery Preoperative and Postoperative Procedure. R.
 J. BELLIARD
 2:00- *Ophthalmology* Orthoptic Clinic. F. C. KEIL,
 JR., E. KRAUBER.

MEMORIAL HOSPITAL

- 9:00-10:30. *Tumor Surgery* Nonoperative Clinic. End
 Results Following Abdominoperineal Resection for
 Cancer of the Rectum Treatment of Cancer of the
 Colon Management of Squamous Cancer of the Anus
 and the Rectum.
 10:30-12:00. *Tumor Surgery* Nonoperative Clinic. End
 Results in the Treatment of Cancer of the Stomach a
 Study of Over 1000 Cases. End-Results in the Treat-
 ment of Malignant Melanomas a Study of Over 900
 Cases.
 2:00-3:00. *Thoracic Surgery* Nonoperative Clinic. Asym-
 ptomatic Thoracic Tumors End-Result in Surgically
 Treated Cases of Carcinoma of the Cervical Esopha-
 gus. End Results in Surgically Treated Cases. WAR-
 BURG.
 3:00-4:00. *Tumor Surgery* Nonoperative Clinic. End-
 Results in Treatment of Bone Tumors. COLEY
 4:00-5:00. *Tumor Surgery* Discussion Cancer in Child-
 ren Presentation of Followed Cases. DARGENT.

METROPOLITAN HOSPITAL

- 9:00-12:00. *General Surgery* Operative Clinic: Surgery of
 Stomach and Duodenum. JAMES M. WINTFIELD and
 STAFF
 Indications. EDWARD J. McCABE.
 Vagotomy JAMES M. WINTFIELD.
 Duodenal Closure and Complications. KENNETH C.
 PEACOCK.
 Surgery of Gall Bladder and Pancreas. KENNETH C.
 PEACOCK.
 Retroperitoneal Tumors. KENNETH C. PEACOCK, JOHN
 SNIDER.
 Peritoneal Spaces. JOHN HEERLIN
 1:00-4:00. *Plastic and Reconstructive Surgery* Operative
 and Nonoperative Clinic. DAVID M. MAYER, JOHN F.
 FORD.

MOUNT SINAI HOSPITAL

- 8:30-12:00. *Genitourinary Surgery* Operative Clinic
 Kidney Operation. LEO EDELMAN
 Nonoperative Clinic. Carcinoma in a Horseshoe Kid-
 ney. GORDON D. OPPENHEIMER.
 Bladder Neck Obstruction in Young Individuals. MORRIS
 SWICK.
 Peritoneal Insufflation. WILLIAM MENCHER.
 Emurelia Due to Ectopic Ureter. H. EVANS LEITER.
 2:00-5:00. *Neurosurgery* Nonoperative Clinic.
 Long Time Follow up in Some Neurosurgical Cases
 Case Presentations. ABRAHAM KAPLAN
 Correlation of X Ray Findings and Clinical Picture. B.
 SCHLESINGER.
 Dumbbell Tumor of the Spine. IRA COHEN
 Cranioplasty Motion Picture Demonstration S. GROSS.

NEUROLOGICAL INSTITUTE
 (See Presbyterian Hospital)

NEW YORK EYE AND EAR INFIRMARY

- 10:00-12:00. *Otolaryngology* Demonstration Anatomical
 Specimens. E. BURCHILL.
 2:00-4:00. *Otolaryngology* Discussion of Pathology with
 Lantern Slides. D. S. D. JESSUP
 The routine clinics of the New York Eye & Ear Infirmary
 will be held as usual during this period, all Fellows of
 the American College of Surgeons are cordially invited to
 attend.

NEW YORK HOSPITAL

- 9:00- *Orthopedic Surgery* Operative Clinic. FRED-
 ERICK LEE LIEBOWITZ
 2:00- *Orthopedic Surgery* Nonoperative Clinic.
 FREDERICK LEE LIEBOWITZ and ASSOCIATES.
 Volkmann's Paralysis Prevented by Sympathetic Block.
 ARTHUR CONWELL.
 Reconstruction Surgery of the Hand (Lantern Slides)
 FREDERICK L. LIEBOWITZ
 Massive Onlay Bone Grafts for Ununited Fractures
 PRESTON WADE.
 Conservative Treatment of Table Fractures of the
 Tibia. BERNARD MAIBEL.
 End Results in Treatment of Fractures of the Neck of
 the Femur by Moore Nails. NELSON CONWELL.
 2:00- *Otorhinolaryngology* Operative Clinic. Surgery
 of the Oropharynx and Nasopharynx. THOMAS GAR-
 RICK.
 3:00- *General Surgery* FRANK GLENN and STAFF
 The Chemistry of Penicillin and Streptomycin. VINCENT
 DU VIGNEAUD.
 Toxicity of Streptomycin. WALTER McDERMOTT
 Treatment of Pulmonary Tuberculosis by Streptomycin
 CARL MURCHENCKO.
 Use of Streptomycin in Treating Surgical Pulmonary
 Tuberculosis. CRANSTON HOLMAN
 Adult Tissue Extract in Wound Healing. JAMES DINO
 WALL.

NEW YORK HOSPITAL
 LYING-IN HOSPITAL

- 11:00- Obstetrical and Gynecological Staff Rounds
 A.B. - *Obstetrics and Gynecology* Operative Clinic
 Gynecological Operations by Resident Staff
 PM- *Obstetrics and Gynecology* Operative and Non-
 operative Clinic
 Cryptomenorrhea—Congenital and Acquired. THOMAS
 L. BALL.
 Results of an Operation for Urinary Incontinence.
 ANDREW A. MARCHETTI, VICTOR MARSHALL.

Pregnancy Following Outlet Operation. WILLIAM FROD
Studies on Patients with Hydranmiotic During the Past
Fifteen Years. PAUL E. MUELLER.

End-Results of the Treatment of Carcinoma of the En-
dometrium. ANDREW A. MARCHETTI, JOHN E. McAL-
LESTER.

Radiological Survey of Breaches. EL L. WILCOX.

NEW YORK ORTHOPEDIC DISPENSARY AND HOSPITAL

8:00- Orthopedic Surgery Operative Clinic. ALAN
DE FOREST SMITH and STAFF

1:30- Orthopedic Surgery General Orthopedic Clinic
HALFORD HALLOCK and STAFF

NEW YORK POST-GRADUATE MEDICAL SCHOOL AND HOSPITAL

9:00- 30. Neurosurgery Operative Clinic (Amphi-
theatre, 6th Floor) Surgery in Hypertension

0:30- 1:00. Neurosurgery Operative Clinic Diseases of
the Vascular System.

1:00-5:00. General Surgery Operative Clinic (Amphi-
theatre 6th Floor)

PRESBYTERIAN HOSPITAL

8:00- General Surgery Operative Clinic Surgery of
The Large Bowel. DAVID C. BULL, ROBERT S. GRIN-
WELL, LOUIS M. ROCHMELLOT, HENRY S. COOPER.

Sympathectomy to Hypertension. RICHMOND I.
MOORE.

Vagotomy for Marginal Ulcer. ROBERT H. RYAN.
Wiring of Arteriosclerotic Abdominal Aneurysm. AR-
THUR H. BLANKENHORN.

1:00-4:00. General Surgery Nonoperative Clinic Physio-
logy of Peritonitis. JOHN S. LOCKWOOD.

Prevention of Wound Infection and Peritonitis. 1st
Sulfamylon and Streptomycin. Case Demonstration.
EDWARD L. HOWES.

Laboratory Experiments and Clinical Results with Bac-
tracin. FRANK L. MCELROY.

Acute Appendicitis Over a Thirty Year Period at Uni-
versity Hospital. RUDOLPH N. SCHULLINGER.

PRESBYTERIAN HOSPITAL NEUROLOGICAL INSTITUTE

9:00- 00. Neurosurgery Operative Clinic Cases Pre-
viously Shown Clinically at the Tuesday Morning
Staff Conference.

PRESBYTERIAN HOSPITAL

SLOANE HOSPITAL FOR WOMEN

9:30- Obstetrics and Gynecology Operative Clinic
Wertheim Operation for Carcinoma of the Cervix.
HOWARD C. TAYLOR, JR.

1:00- Obstetrics and Gynecology Nonoperative
Clinic Trends in the Treatment of Uterine Carcinoma.
HOWARD C. TAYLOR, JR.

3:00- Obstetrics and Gynecology Nonoperative Clinic
Rh Factor in Obstetrics. J. GREENE.

4:00- Obstetrics and Gynecology Nonoperative Clinic
Late Follow-up Results in the Treatment of Pregnancy
A. J. TELLMAN.

PRESBYTERIAN NEW YORK ORTHOPEDIC HOSPITALS

Fracture Service

9:00- 1:00. Fractures and Traumatic Surgery Fracture
Service Grand Rounds and Conference.

1:00-4:00. Fractures and Traumatic Surgery Nonopera-
tive Clinic.

Role of Sympathetic System in the Surgery of Trauma.
The Treatment of Shock Coincident with Trauma.
JOHN SCHULDER.

ROOSEVELT HOSPITAL

9:00- General Surgery Nonoperative Clinic Tumors
of the Stomach With Colored Photographs of Specimens.
HOWARD A. PATTERSON.

Demonstration of Stomach Tumor Specimens. WALTER
BRAKETER.

Some Late Results of Conservative Treatment in Vascu-
lar Problems. GRANT P. PROCTOR.

The Observed Effect of Various Drugs on Intestinal Act-
ivity (Motion Picture Demonstration). DAVID M.
WICKER.

ST VINCENT'S HOSPITAL

9:00- General Surgery Operative Clinics and Demon-
stration Cases of Trauma Fractures. MACTICE,
FRANK CONWAY, LOUIS SARTMAN, JOHN A. FALLON,
MAURICE O'SHEA.

9:00- General Surgery Tumor Clinic and Follow-up.
GEORGE R. STEARNS and Tumor Committee.

9:00- Neurosurgery Nonoperative Clinic The Re-
sults of Conservative Treatment of Acute Head In-
juries. FRANKLIN ROBINSON.

1:00- Pathology Display of Fresh Pathological Mat-
erial of Systemic Diseases by Kodachrome Slides
of Fixed Specimens. ROTHSCHILD and ASSOCIATES.

SLOANE HOSPITAL FOR WOMEN

(See Presbyterian Hospital)

VETERANS ADMINISTRATION HOSPITAL

9:00- General Surgery Operative Clinic. CARLES
WEEKS, JOHN E. SULLIVAN.

9:00- Thoracic Surgery Operative Clinic. WALTER
CHANDALL, ARON HODMELSTEIN, RICHMOND MOORE.

9:00- Orthopedic Surgery Operative Clinic. STEPHEN
EICHENHOLZ, ROBERT PATTERSON, FRANK E. STEIN-
FIELD.

9:00- Head and Neck Surgery Operative Clinic.
EDGAR L. FRANKEL.

9:00- Plastic Surgery Operative Clinic. HERBERT
CONWAY.

9:00- Radiation Therapy Exhibit and Presentation
Bronchogenic Carcinoma—Analysis of Diagnosis and
Therapy with End Results. A Study of 600 Cases.
ARON SHERIDAN, BERNARD ROSENTHAL, JOSEPH STEIN
and RESIDENT STAFF.

9:30- 1:30. Medical Rehabilitation Clinic. HARRY KIN-
SLER, KARL HANFINGER, IRWIN D. STEIN, BERNARD
STULL, JACOB BYER.

1:00- General Surgery Nonoperative Clinic: Tho-
racolumbar Sympathectomies. CARLES WEEKS.

3:00- Plastic Surgery Conference: HERBERT CON-
WAY, CLARENCE R. STRAUSSER, CORNELIUS J. KRANTZ,
ROBERT H. CHAFFORD and RESIDENT STAFF.

3:30- Anesthesia Section. Conference: Endotracheal
Intubation. Electrocardiographic Changes During
Intrathoracic Surgery. EMERY ROYCE, HAROLD
BISHOP, CHARLES BURSTEIN and RESIDENT STAFF.

EXHIBITS

Anesthesia Section	Results of Vagus Section
Bronchogenic Carcinoma	Pathology Section
Review of 600 Cases	Medical Illustrations
Intracranial Neoplasms	Laboratory
Residency Training Program	Plastic Surgery
Organization of Surgical	Prosthetic Appliances
Division	

CLINICS IN BROOKLYN—LONG ISLAND HOSPITALS

Friday

CUMBERLAND HOSPITAL

- 9:00-12:00. *General Surgery* Operative Clinic. Cancer and Prostate. HOWARD T. LAMOWORTHY and STAFF
Orchiectomy for Prostatic Metastases. Late Results.
Cancer of Bladder with Transplantation of Ureter. Late Results. LEO DREKLER and STAFF
12:00-5:00. Nonoperative Clinic. Diagnosis and Management of Ureteral Calculus, Results in 255 Cases. FRANK C. HAMM.
Late Results in Thrombophlebitis and Phlebothrombosis. WARD CIELLY
Tumors in Children. HERMAN CHARACH.
Convulsions During Anesthesia. Late Results
Late Results in Surgical Jaundice.

KINGS COUNTY HOSPITAL

- 9:00- *Gynecology* (Kings County Division) Operative Clinics. GARLICK, McGOLDRICK and MUELLER.
9:00- *Thyroid Surgery* Operative Clinic. Thyroidectomy. ANTHONY PIRRODDI
9:00- *General Surgery* Nonoperative Clinic. JOHN F. RAYCROFT and STAFF
Cholecystectomy in the Acute Gall Bladder as Compared with Cholecystectomy in the Chronic Gall Bladder. IRWIN P. TRAM
Use of the Miller Abbott Tube As an Aid in Intestinal Surgery. JOHN F. RAYCROFT

- Review of Gastric and Duodenal Surgery. HARVEY F. POTTER.
Fracture of the Neck of the Femur—Five year Study with Follow-up. VINCENT S. MAGGIO.
Case Report. Congenital Idiopathic Dilatation of the Common Bile Duct. JOHN F. RAYCROFT
Review of Amputations of the Lower Extremities. THOMAS W. HYMAN.
Review of Acute Appendicitis. PETER FIORE.
Review of Large Bowel Surgery. BERNARD J. FICARRA.
Therapy of Peripheral Vascular Disease. C. BURLING ROESCH.
10:00- *Thyroid Surgery* Nonoperative Clinic. Use of Propyl Thiouracil.
12:00- *Gynecology* Nonoperative Clinic. Follow up of Gynecologic Malignancies. JOSEPH MCGOLDRICK.

LONG ISLAND COLLEGE HOSPITAL

- 12:00- *General Surgery*
Operative Program. EMIL GOETSCH and STAFF
Fractures and Other Trauma. S. POTTER BARTLEY
HAROLD LAROE.
Diagnostic and Therapeutic Nerve Blocks. PAUL ANSERO.

METHODIST HOSPITAL

- 9:00-12:00. Tumor Clinic (Late Results). PIERRE A. RENAUD. Moderator and Hospital Staff

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August, 1947

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GYNECOLOGY AND OBSTETRICS
Supplement

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COLLECTIVE REVIEW

THE ETIOLOGY OF THE ONSET OF LABOR

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INTRODUCTION AND HISTORICAL

AVICENNA has said that at the end of 9 months labor occurs by the grace of God" (Kurzrok). Four centuries before the Christian era, Hippocrates attributed the onset of labor to a decline in the nutritional status of the fetus (Findley). At that time he said "When there is no more food for the young one in the egg and it has nothing on which to live, it makes violent movements, searches for food, and breaks the membranes. The mother perceiving that the embryo is vigorously moving smashes the shell," and in reference to mammals

"In just the same way when the child is grown big and the mother cannot continue to provide him with enough nourishment, he becomes agitated, breaks through the membranes and incontinently passes out into the external world free from any bonds. In the same way among the beasts and savage animals, birth occurs at a time fixed for each species without overshooting it, for necessarily in each, nourishment will become inadequate. Those which have least food for the foetus come quickest to birth and vice versa. That is all that I had to say upon the subject (Needham Reynolds). According to Hippocrates, the child presses its feet against the fundus uteri and its head against the cervix, thus opening the uterine orifice (Gunn).

Despite the advances of medical science, a complete understanding of the cause of the onset of labor is lacking. A great deal is known about

the intimate details of the mechanism of labor but, other than conjecture almost nothing is known about what actually starts uterine contractions.¹

In the following review every attempt has been made to include all articles in the voluminous literature on the onset of labor from January 1938 to June, 1946. Pertinent articles have been included whenever deemed necessary regardless of date or subject, but no attempt has been made to include all articles on other however related subjects.

SUMMARY OF CURRENT TEXTBOOK OPINION

DeLee mentions, as causes of the onset of labor excessive distention of the uterine wall, the presumptive influence of the menstrual cycle so that labor occurs after 10 cycles, pressure of the presenting part on the lower uterine segment and cervix, the importance of accidental causes, and endocrine effects. Greenhill has added more details of the hormonal aspects of the problem to DeLee's original text. Mention is made of the sensitization of the uterus to pituitary extract by estrogens, its increasing activity under the influence of estrogen, and the antagonistic effects of progesterone. The use of massive doses of estrogens to induce labor in missed abortion and missed labor with dead fetus is stressed.

Williams-Stander lists the growing irritability of the uterine musculature, progressive distention of the uterus, dilatation of the cervix by the presenting part, distention of the lower uterine segment and the surrounding nervous structures,

¹Submitted in partial fulfillment of the requirements for the Degree of Doctor of Medical Science.

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excess of carbon dioxide and lack of oxygen in the placental blood which act on nervous structures or contribute to such changes in the decidua as loosening thinning and thrombosis menstrual periodicity the questionable anaphylactic action of fetal blood heredity and habit, senility of the placenta, metabolic changes, and the importance of autacoids. In his latest text Stander has included the work of Bourne and Zuckerman on the establishment of artificial estrous cycles in castrate rats. Stander suggests that the adrenals may cause the cyclic pattern resulting from the continued administration of small doses of estrogens to castrate women.

Reynolds has done more than any other individual to illuminate the previously confused field of uterine physiology. He believes that the onset of labor is the result of the gradual accelerating co-operation of a number of factors—anatomic, physiologic, humoral, nervous, nutritional, and circulatory—which at a time characteristic of the species are so associated as to lead to the evacuation of the uterus. His contributions will be discussed in greater detail later.

EXISTING HYPOTHESES ON THE CAUSE OF THE ONSET OF LABOR

The existing hypotheses regarding the cause of the onset of labor may be arbitrarily divided into three groups for the purposes of discussion: (1) chemical, (2) mechanical, and (3) hormonal. These three groups overlap and it is impossible to clearly allocate specific articles to any one of the groups.

REVIEW OF THE LITERATURE ON CHEMICAL THEORIES

In a recent review Danforth and Ivy attribute the start of parturition to the combined synergistic resultant of increasing uterine distention, alterations in the ionization of calcium and other essential ions, and the control of autacoids. They mention the effect of variations in endocrine balance, especially estrogen level upon blood calcium fixed base, and calcium ionization. Danforth and Ivy believe that as the estrogen level rises toward term calcium ionization increases and produces the known increase in uterine irritability. This, together with growing uterine distention, causes the beginning of uterine contractions. Calcium ions thus act as an intermediary between the autacoids and their uterine endorgan. They point out, however, that at present no scientifically accurate method exists for the precise mensuration of calcium ionization and state that the final proof of their interesting conception awaits such a method. Other authors concur as

to the importance of chemical factors in uterine activity and labor (Wattenwyl, Karnaky Reynolds).

A survey of the literature on calcium ionization reveals considerable discrepancy of opinion regarding its determination (Chu and Hastings, Correll and Hughes, Dillman and Vischer, Drinker *et al.*, Eversole *et al.*, Eversole, Fales, Greenberg and Gunther, Hammett, Hitchcock, Hughes *et al.*, Ingraham *et al.*, Kendall Smith and Sternberger, Thomas, Yarnot). Several authors have used collodion membrane ultrafiltration (Greenberg) followed by barium sulfate adsorption (Benjamin, Benjamin and Hess). The latter procedure is of doubtful value (Greenberg, Greenberg and Larson) despite statements to the contrary (Benjamin). Other techniques for the determination of calcium ions depend upon high pressure ultrafiltration through cellophane membranes (Nicholas), electrodes of the third kind (Joseph), ultracentrifugation (Chanuth *et al.*, Ludewig *et al.*, Masket *et al.*), empirical formulas of varying degrees of exactness and clinical applicability (Rona and Takahashi, McLean and Hastings, McLean and Hinrichs, Morrison *et al.*, Gutman and Gutman) and biological indicators of moderate accuracy such as the frog heart (McLean and Hastings, Morrison *et al.*, Spelman) and the guinea pig uterus (VanDyke and Hastings).

The formula of Rona and Takahashi is one of the simplest and forms the basis of the later mass law equations of McLean and Hastings and others. It was later modified to

$$\frac{(\text{Ca}^{++}) \times (\text{Protinate}^-)}{\text{Ca Proteinate}} = K$$

(McLean and Hastings)

The original references contain chemical constants and other data. VanDyke and Hastings state "Changes in the response of the (guinea pig) uterus to constant doses of pituitary extract when placed in solutions in which all of the ion concentrations, except calcium, have been constant, have been interpreted as indicating differences in calcium ion concentration in the solutions. In a sense the uterus has been a biological calcium electrode." They note that changes in the carbonate ion activity and calcium ion concentration cause the greatest changes in activity of the isolated guinea pig uterus.

The calcium ion concentration in serum is quoted as varying from 2 to 6.4 mgm. per cent. The higher figures (3 to 6 mgm. per cent) are the more probable (Schmidt and Greenberg, Updegraff *et al.*). In an exhaustive review Schmidt and Greenberg remark that a very large part of the

evidence offered for the existence of calcium compounds other than ordinary calcium ion in the diffusible fraction of blood serum is either insufficient incorrectly interpreted or in many instances, quite incorrect and later The follicular hormone is said to increase the serum calcium concentration of castrated animals. More will be said of this later but suffice it to say here that the experimental results on the ionization of calcium are quoted with great frequency in the medical literature (Best and Taylor Peters and VanSlyke Danforth and Ivy Bodansky) despite their relative inaccuracy.

There is an increase of diffusible ionized calcium and a decrease of total serum calcium in the latter part of pregnancy and labor (Cantarow *et al* Bodansky and Bodansky Bodansky and Duff Zwarenstein, Nicholas *et al*) It is possible that the growth of the ionized fraction is a relative and not an absolute expansion (Andersch and Oberst).

Thus, blood calcium is divided into diffusible and nondiffusible fractions. The diffusible or ultrafiltrable fraction is entirely ionized whereas the nondiffusible or nonfiltrable fraction is largely protein-bound in the form of calcium proteinate. The methods for measuring calcium ionization are scientifically inaccurate. Direct methods do not exist and indirect means are employed. The invention of a suitable calcium electrode (a direct way) would end the present controversies and permit clarification of the problem of the relation of physiologic calcium ionization to uterine activity.

Considerable doubt exists that continued massive estrogen dosage will affect the serum calcium of mammals (rat rabbit monkey) (Levin and Smith) as it will of other animals, notably the chicken (Heller *et al* Avery *et al* Bremer Lan dau *et al* Zwarenstein, Schmidt and Greenberg Correll and Hughes) other than transiently. Despite the well known antagonism of androgens and estrogens injection of either androgenic or estrogenic substances into patients with skeletal metastases from mammary carcinoma increases metastatic growth and raises serum calcium and urinary calcium (Farrow and Woodard) Skeletal bone resorption or osteoclastosis follows massive estrogen dosage in mice (Gardner and Pfeiffer) while osteitis fibrosa cystica results from similar treatment of rats (Bremer) Estradiol benzoate injections into immature mice for many weeks cause osteoclastosis of the long bones and pubic bone resorption. The higher dosages give rise to greater sclerosis (Sutro) Prolonged administration of estradiol benzoate to young dogs produces inhibition of skeletal growth but no osteoclastosis

(Sutro and Pomerantz) Hypercalcemia is the standard toxic reaction to ergosterol (Hess *et al*) A transitory rise in the calcium content of the immature rat uterus is found following single massive dose estrogen injections (Talbot *et al*) while estrone has no effect on uterine anaerobic glycolysis (Sweeney) The lowered serum calcium found after the middle trimester in pregnancy (Bodansky and Bodansky Bodansky and Duff) may perhaps be correlated with rising levels of estrogen and progesterone.

Numerous investigations have conclusively shown that ionic calcium increases the activity of the uterus of the dog guinea pig and rabbit (Danforth and Ivy Rouse and Blanchard Okai, Johnson Greig) This also holds for smooth muscle in general (Evans) and presumably for the human uterus (Reynolds) A calcium deficient diet in the kod and chick produces a defect in neuromuscular transmission, such that a single maximal motor nerve volley fails to elicit a maximal response from the muscle in question (Brown and Harvey) Either excess or deficiency of ionized calcium results in neuromuscular block in frog nerve-muscle preparations (Kuffler) The presence of ionized calcium is essential for uterine contractions (Ivy).

Magnesium increases the response of the guinea pig uterus to posterior pituitary extract (Fraser) but reduces its general activity (Reynolds) while magnesium and potassium are antagonistic to calcium as regards the uterus (Reynolds) Magnesium ion exerts an immediate spasmolytic effect upon the tetanic human uterus. It abolishes tetany due to pituitrin pitocin pitressin quinine ergonovine, or methergine. It is useful in the tetany of spasmodic dysmenorrhea, afterpains and dystocia (Bandring) (Abarbanel).

Since the blood strontium level is normally extremely low (Fay *et al* Cole *et al*) it may be assumed that its normal physiologic activity is nil. Nevertheless, its activity is greater than that of calcium as an experimental uterine muscle stimulant (Cole *et al* Cole Harned and Cole Fay *et al* McCance and Widdowson) On the whole its toxicity is less than that of calcium (Cole *et al* McCance and Widdowson).

The production of histaminase by the placenta has been correlated with uterine contractions and placental aging more histaminase is produced when there are poor contractions, less when the contractions are stronger. The amount of histaminase found is in no way directly related to uterine contractions but rather is an index of the amount of active functioning parenchymatous tissue in the placenta. Physiologic senescence is a salient factor in the onset and maintenance of

labor (Danforth) (See Mandel *et al*) The blood pressure falls with each uterine contraction in pregnant cats. The hypotension has been attributed to the rhythmic production of histamine by the placenta, which causes both uterine contractions and blood pressure fall (Handovsky)

Oxygen consumption of the human placenta falls in pregnancy presumably because of senescence (Wang and Hellman) There is no correlation between placental senescence and the onset of labor (Mandel *et al*) Oxygen supply to the fetus is greatest during uterine contractions (Windle and Steele, Barcroft *et al*) During labor pains effective maternal arterial pressure to the placenta diminishes—sometimes to zero (Woodbury *et al*) This may cause additional placental aging during labor (Mandel *et al*)

Amniotin, estradiol, estradiol benzoate, estradiol dipropionate, and triphenyl ethylene (a synthetic estrogen) increase within an hour the acetylcholine content of the uterus of the ovariectomized rabbit (Reynolds and Foster Reynolds) There is the same amount of acetylcholine in the uteri of both estrogen treated and untreated spayed rabbits (Emmens *et al*) The blood choline concentration does not appreciably vary in pregnancy labor and the puerperium (Eagle) Acetylcholine has been suggested as the normal causal oxytocic agent in labor (Reynolds)

There is a definite shortening of the duration of labor following the prolonged use of a salt-poor diet in pregnancy This may be due to the reduction of uterine muscle edema on such a regimen (Pomerance and Daichman Wadlow Schuitens, Balasgride)

Summary and conclusions The rising levels of sex steroids in pregnancy cause a progressive increase in calcium ionization, uterine irritability, contractility and motility Calcium ions are essential for normal uterine muscle irritability, contractility and motility The periodic uterine muscle contractions occur with growing strength, co-ordination, and frequency throughout pregnancy because of the synergistic action of the sex hormones and the concomitant rise in the concentration of calcium ions The basic mechanism here is hormonal the secondary assisting and co-operating factor is chemical.

The hormonal mechanism can produce uterine contractions and labor with a normal, or even a low level of calcium ionization. The heightened concentration of calcium ions at term assists the endocrines in bringing about parturition but is in no wise a causal factor alone. Calcium ions do not mediate between the autacoids and uterine muscle they merely provide part of the essential

physiologic environment which permits response of uterine muscle to sex steroids, acting in this sense like any other tissue metabolite.

REVIEW OF THE LITERATURE ON MECHANICAL THEORIES

Uterine distention is an important factor in the determination of uterine growth uterine contractions, and, eventually parturition. The distention-growth response (hyperplasia and hypertrophy) in the uterus of the ovariectomized rabbit is dependent upon maturity because it does not occur in immature rabbits with uteri distended with paraffin pellets. It also does not occur in estrin treated ovariectomized rabbits, but it appears in those treated with progesterone. Progesterone increases the tolerance of uterine muscle to distention, because the growth stimulus must be greater (more distention) to produce the same growth as in nonprogesterone-injected ovariectomized rabbits (Reynolds) The intrauterine pressure does not differ greatly in normal and hydramniotic pregnant women, and the rise in intrauterine pressure is not proportional to uterine expansion. The pressure in the uterus before labor is practically nil (Wieloch) The intrauterine pressure bears no relationship to either the volume of the uterus or the amount of amniotic fluid. In primiparas the intrauterine pressure is inversely proportional to the duration of labor (Salerno)

The motility of the uterus in vivo has been studied by means of intrauterine insufflation with variations recorded by a kymograph (Rubin, Mayer *et al*) intrauterine balloons (Bickers, Wilson, Wilson and Kururok) extrauterine devices such as the Lorand tocomograph (Lorand, Murphy) electrically (Fenning *et al*) Katzenstein, Katzenstein and Soskin, Jacobson *et al*, Langman and Burr Border Balassa and Gurd) and in experimental animals by means of mechanical lever systems (Clausberg Reynolds) In addition, studies in vitro have been made of the entire excised uterus or uterine strips (Sun, Adair and Haugen) It is probable that all in vitro observations on any uterus are misleading (Bell) Furthermore, observations on the primate uterus are far more reliable than those made on other species, as regards significance for the human (Hartman)

The uterus demonstrates increased activity under the influence of estrogens (Knaus, Novak, Falls, Adair and Haugen, Murphy Wattenwyl, Langman and Burr Krohn *et al*) and decreased activity under the influence of progesterone (Reynolds, Knaus, Novak, Falls, Langman and Burr Krohn *et al*) Opposed to this viewpoint is the

demonstrated synergism between progesterone and estrogen, with heightened uterine activity and co-ordination in the luteal phase of the menstrual or estrous cycle (Wilson and Kurzrok, Bell, Bell and Robson, Page and Woods, Bickers, Bickers and Main Henry and Browne). Clinically, the uterus becomes quiescent in patients with threatened abortion or labor treated with progesterone (Falls, Falls *et al* Krohn *et al*). Experimentally the human uterus does not respond to progesterone *in vivo* (Bickers, Page and Woods). Greater uterine activity and co-ordination in the luteal phase are also suggested by anatomical and endocrine studies on the endometrium and mucosa of the vagina (Hartman, Bartelmez, Markee, Engle).

The uterine motility of the guinea pig undergoes a cycle characterized by lowered amplitude and greater frequency of contractions during the time of activity of the corpus luteum. The immediate cause of this variation appears to be an impairment of conduction of the contraction wave between the ovarian and vaginal ends of the uterus. Alterations of the calcium content of the uterine bath appreciably affect the motility cycle and may mask it entirely (Greig). Progesterone does not alter the uterine activity induced by stilbestrol (Lackner and Tulsky). Testosterone propionate acts like combined estrogen-progesterone in producing characteristic uterine motility patterns in castrate women (Wilson and Kurzrok).

Neither spontaneous uterine activity nor response to injected oxytocin in spayed mice treated with estrone is modified by either testosterone or progesterone. Progesterone does not desensitize the mouse uterus to injected oxytocin *in vivo* (Bell and Robson). These findings have been confirmed in the spayed rhesus monkey (Bell). The degeneration of the corpus luteum at the fortieth day of pregnancy in the guinea pig corresponds with the middle of the transition period from low to high reactivity of the uterus to oxytocin *in vivo* (Bell). This partially corresponds with the results obtained in the human with external and internal hysterography *in vivo* (Bickers, Murphy, Fenning) and with observations on the human uterus and uterine strips *in vitro* (Adair and Haugen, Sun). Uterine tetany disappears after rupture of the membranes during labor. Spontaneous contractions cease after the tenth day of the puerperium as do the responses to pituitrin, paralleling the fall in the concentration of blood estrin. A certain degree of intrinsic uterine motility can be restored by the administration of estrogen while the uterus again be

responsive to pituitrin. The practical value

of this observation in puerperal hemorrhage occurring after the fifth day is apparent (Bickers).

Under the influence of emotional stress, the human uterus displays its greatest activity during the pregestational phase of the menstrual cycle (Robertson). On the other hand, electrometric studies reveal that in castrate women uterine activity is reduced by progesterone and intensified by estrogen (Langman and Burr). In the rat uterus there is a correlation between electrical chronaxie and phases of the estrous cycle. The highest excitability shortest chronaxia is found in estrus, while estrogen therapy heightens excitability to levels comparable to those found in spontaneous uterine estrus. It is possible that the ovary elaborates an inhibitory substance which cyclically decreases excitability; this is felt to be distinct from progesterone (Katzenstein, Katzenstein and Soskun) (also see Bourne and Zucker, DiPaola). Injection of estrone into the cat and rabbit produces an increase in electrical excitability and resting potential of the uterus. Responses of the isolated uterus are local during anestrus (muscular movements weak and incoordinated) but conducted during estrus (entire uterus involved in contraction wave). These changes in excitability which are not truly comparable to chronaxia make explicable the changes in uterine motility during the sexual cycle (Boaler). Electrical potentials in the cat uterus are most active in estrus and late pregnancy least active in early pregnancy or during pregestational proliferation. Conduction of impulses from cell to cell is characteristic of estrus (Balassa and Gurd). The uterus relaxes after parenteral administration of corpus luteum extract to the human being; this has been recorded simultaneously electrically and with an intrauterine balloon (Jacobson *et al*). In human beings, pregnancy is merely a continuation of the luteal phase of the menstrual cycle in which maximum amplitude of uterine contraction waves is reached at the onset of menstruation (Wilson).

Reynolds has commented upon the fact that excessive distention alone will produce uterine motility during any phase of the menstrual cycle. He believes that pressures above 20 mm of mercury produce artifactual motility when intrauterine balloons are used, and, therefore that the work of Knaus, who did not use pressures above 20 mm is most reliable. However Bickers and Main point out that no amount of distention will stimulate contractions in the castrate unless the uterus is first sensitized by estrogens. Moreover according to McLellan alterations in the distending pressure do not necessarily alter spontaneous

contractions or reactivity to pituitrin, while a pressure above 20 mm. of mercury is necessary to ensure proper recording.

The opposing schools may perhaps be reconciled by noting that low amplitude, high frequency, somewhat tetanic contractions are characteristic of the normal uterus during the follicular phase while higher amplitude, lower frequency contractions devoid of tetany are characteristic of the luteal phase. In anovulatory cycles the follicular type of contraction prevails throughout, while there is temporary abolition of intrinsic motility during coitus (Bickers and Main).

The human uterus contracts rhythmically throughout life from before birth until after the menopause. The contractions differ in different pregnant individuals, during labor and in the puerperium. There are no spontaneous contractions in the lower uterine segment, which does not contract except in response to pituitrin. This peculiarity may conceivably lead to uterine rupture because the upper and lower uterine segments act against one another when under the influence of posterior pituitary extract. The spontaneous contractions of the upper uterine segment correspond to the Braxton-Hicks contractions and afterpains of the post (Sum).

An increased frequency of response to pituitrin occurs in multigravidas rather than primigravidas, during labor rather than before labor later in pregnancy than earlier after the larger does rather than the smaller ones, and when the uterine wall is tense rather than when it is relaxed (Murphy). The tetanic type of response is most often observed when the dose is large and tension of the uterine wall high. The uterus becomes most active and reactive to posterior pituitary extract during the week or two immediately preceding clinical labor. Uterine activity grows progressively during pregnancy, the greatest augmentation occurring in the middle of pregnancy at the thirty-second week. Patients with uterine contractions prior to the thirty third week are apt to have shorter labors. Multigravidas and patients with short labors are likely to have contractions during late pregnancy which are less frequent, more rhythmic, stronger and longer in duration than primigravidas and individuals with longer labors (Murphy, Fenning, Robson and Schild). The heightened rapidity and strength of response as pregnancy advances may indicate that a posterior pituitarylike hormone is elaborated which potentiates the effect of injected posterior pituitary extract (Murphy).

The percentage of positive reactions of human uterine muscle strips *in vitro* is higher to pitressin

than to pitocin in both gravid and nongravid uteri (Adair and Haugen). *In vivo*, however, oxytocin causes muscular contractions of the uterus but has little or no effect on the blood flow through the uterus, whereas vasopressin always decreases the blood flow whether or not it causes a relaxation (Robson and Schild). Vasopressin exerts a direct inhibitory action on uterine muscle (Robson and Schild). The uterus responds to posterior pituitary extract immediately before and during menstruation and in the early interval part of the cycle. The nongravid human uterus is caused to contract by vasopressin and not at all by oxytocin (McLellan). The uterus of the castrate woman is quiescent and insensitive to pituitrin, intrinsic motility and sensitivity to pituitrin are restored by estrogen. In cases of missed abortion with a negative Friedman test the uterus is quiescent and insensitive to pituitrin, spontaneous motility is induced by estrogen and the sensitivity to pituitrin is re-established, which permits evacuation of the uterus (Bickers and Main).

Uterine tonus rises progressively as pregnancy continues, but during the last lunar month less than 50 per cent of the patients have measurable tonus. On the other hand, very high tonus has been recorded in a patient with abruptio placentae undergoing labor. The contraction pattern in false labor resembles that in true labor, no distinguishing traits have been observed. The uterine contraction pattern of normal labor is described as (a) contractions of appropriate magnitude, (b) relatively high degree of rhythmicity and (c) contractions which resemble one another closely in magnitude and general character. Primary inertia, on the other hand, is distinguished by a contraction pattern of (a) contractions of small magnitude, (b) arrhythmicity of occurrence of successive contractions, and (c) contractions which fail to resemble each other in magnitude and general character (Murphy). The original observation of Lownd that primary uterine inertia consists of three categories—normotonic, hypotonic, and hypertonic—has been confirmed by Murphy.

The advance of labor produces progressive increases in uterine tonus, strength of intermittent contractions, total amount of energy expended, and frequency of contractions, while the duration of contractions shortens. Primiparas experience a higher tonus during labor than do multiparas, while multiparas experience stronger contractions than do primiparas. Dystocia augments the already high tonus of primiparas and the already strong contractions of multiparas. It prolongs the duration of contractions of all patients. Poor

uterine motility is not the important factor that determines the direction of rotation of an occiput which engages in the posterior position (Murphy) Labor is almost universally accompanied by intermittent contractions but may proceed to completion in the absence of such contractions if uterine tone is persistently high. Labor never occurs in the absence of both intermittent contractions and a persistently high uterine tone. Intermittent contractions are not indispensable to the process of labor and do not play a significant role in deciding the length of the first stage of labor (Murphy). Continuous caudal analgesia causes a successive decrease in uterine tone in 44 per cent of patients examined. Only 20 per cent of patients have any lessening of uterine motility if the level of analgesia does not rise above the sixth to tenth thoracic segment (Frankel).

Morphine has no effect on uterine contractions (Murphy, Adair and Pearl). Morphine sometimes strengthens, sometimes weakens uterine contractions (Gunn). The uterine musculature is not directly affected by the doses of morphine commonly used in obstetric analgesia (Goodman and Gilman). Morphine causes a disturbance of the mechanism of labor and a prolongation of labor in the rabbit, but does not directly affect fetal respiratory exchange (Snyder and Geiling).

Benzedrine sulfate produces a prolonged spastic contraction of uterine strips from the virgin guinea pig (Boyd). The uterus of all animals are contracted by benzedrine (Goodman and Gilman). Epinephrine causes inhibition of uterine muscular contractions in the guinea pig (Boyd). The human uterus usually contracts in response to epinephrine, whether gravid or nongravid (Goodman and Gilman, Adair and Haugen, Gunn).

Parturition occurs normally independent of or in the absence of innervation to the uterus (DeLee, DeLee and Greenhill, Williams-Stander, Stander, Whitehouse and Featherstone, Elkin, Blittman, Danforth and Ivy, Reynolds, Salgado). Direct observation of the uterus under spinal anesthesia suggests that the action of the central nervous system on the human pregnant uterus is one of sustained inhibition. This inhibition is most pronounced before the sixteenth week and reappears near term (Mifalpas).

The lower uterine segment or isthmus uteri is evident at 3 months of pregnancy below the physiologic retraction ring or Aschoff's anatomic internal os. The first stage of labor is accompanied by retraction of the isthmus uteri, the second stage by retraction of the cervix. High retraction of the cervical lips characterizes labor in man and monkey. Retraction is essentially the same process in

both upper and lower segments. Most of the expulsive work of the uterus in labor is performed by the upper segment. The so-called thinning out of the isthmus uteri does not occur in the monkey, and may not occur in man. Separation of the placenta is almost completed by the end of the second stage of labor in the monkey and presumably in man (Danforth, Danforth and Ivy, Danforth *et al.*, Ivy, Ivy and Rudolph).

Retraction is an economical and relatively non-energy consuming process whereas contraction is an energy consuming process. Retraction or brachystasis is a relative fixation of a muscle at shorter length; the muscle shortens and at the shorter length manifests the same tension. Mectomy is a relaxation or elongation of muscle fiber at the new length it manifests the same tension. These mechanisms permit enlargement of the uterus to adapt itself to the growing fetus without change in intrauterine tension (Ivy, Danforth and Ivy, Danforth *et al.*, Ivy and Rudolph, Wieloch). Beyond a certain point however this does not hold and the effects of distention upon uterine muscle are seen (Reynolds).

Summary and conclusions. The sequence of events leading toward the beginning of labor includes the factor of increasing uterine distention. This distention progressively heightens the efficiency of uterine contractions, in conjunction with the steadily rising output of placental estrogens. Brachystasis and mectomy of the uterine musculature concomitant with rising progesterone levels permit uterine enlargement without significant alteration in intrauterine pressure. Estrogen and progesterone synergistically co-ordinate uterine activity and stimulate spontaneous uterine contraction and intensify reactivity to posterior pituitary secretion. Development of the lower uterine segment proceeds toward term at which time it actively participates in labor. Successive increases in uterine tone and in the strength, duration, and frequency of uterine contractions occur. The onset of labor is physiologically concomitant with (1) optimal uterine distention, (2) high uterine irritability, (3) complete development of the isthmus uteri, (4) strong frequent, spontaneous and co-ordinated contractions of the corpus uteri, (5) high uterine muscle reactivity to pituitrin and (6) effective uterine inhibition by the central nervous system.

REVIEW OF THE LITERATURE ON HORMONAL THEORIES

The earlier conception of Hippocrates that the onset of labor is due to a decline in the nutritional status of the fetus is not altogether fanciful. A

decline in fetal nutrition or oxygen supply may cause the fetus to produce a fetal hormone that initiates parturition (Gibbons). On the other hand, studies of the reserve capacity of the placenta show that it is more than sufficient for fetal needs, even in the presence of severe infarction (Williams-Stander Mandel *et al*). In addition, removal of the fetus alone with the placenta left viable and *in situ* does not prevent gestation from proceeding to term, while labor occurs at the normal time (Reynolds, Newton and Lits, Newton and Beck, Kirsch Deanesley and Newton, Murphy). The placenta (alone) is necessary for labor (Ivy). The mechanism for the continuation of pregnancy in the mouse is the maintenance of the corpus luteum by the placenta (Deanesley and Newton). The preservation of body weight and reabsorption of the symphysis pubis in the presence of the retained placenta occur normally in the absence of the pituitary in the mouse whereas the ovaries must be present (Newton and Beck). The presence of the placenta in the mouse sustains mammary development in the absence of the ovaries (Newton and Lits).

The nonessentiality of the posterior hypophysis for normal pregnancy and labor has been frequently demonstrated (Reynolds, Dixon and Marshall, Flör Kurzrok, Novak, Robson, Smith White, Allen *et al*). The hypophysis is not necessary for labor (Ivy). These experiments have not been repeated in primates (Hartman) and considerable evidence to the contrary exists (VanDyke Ferguson, Haterius and Ferguson, Fisher *et al* see Hartman *et al*).

There is an oxytocic substance in the blood and urine of pregnant and parturient women which may be identical with extract from the posterior pituitary lobe (Fontes, Gibbons, Brdiczka Chang *et al*, Kurzrok, Clauberg). No such oxytocic entity can be demonstrated by the action of pregnancy serum on the human nonpregnant uterus (Lackner and Tulaky). A recent repetition of the earlier experiments of Fontes, with serum from normal men nonpregnant women gravid women, and parturients, has resulted only in a nonspecific oxytocic effect by all sera on reacting uteri of the nonpregnant guinea pig *in vitro*. A protein-free serum filtrate has been without influence on any of the uteri (Graff *et al*, Jeffcoate). The only good evidence for the hormonal activity of the posterior lobe of the hypophysis is the result of its extracts on the uterus (Reynolds). Certain experimental conditions cause the release of oxytocin from the posterior pituitary lobe (Chang *et al*, Fisher *et al*, Ferguson, Haterius and Ferguson VanDyke). The identity of the supposed oxytocin

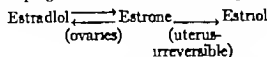
in the blood and urine of pregnant and parturient women has yet to be established (Reynolds) but it appears to be identical with extract from the posterior pituitary lobe (Clauberg). A rising concentration of melanophore expanding principle in the blood serum during pregnancy reaching its highest level during labor and disappearing in the puerperium, has been described (Clauberg). While this principle is not identical with the oxytocic extract of the posterior pituitary lobe (Allen *et al* A.M.A.) a rising concentration may indicate an augmented activity of the posterior hypophyseal lobe during labor (see Robson).

The physiology of the estrogenic autacoids in the pregnant and nonpregnant animal and man has been exhaustively investigated (Allen *et al*, A.M.A. Best and Taylor Kurzrok). The coagulation reaction of the rodent vagina (Allen) and growth and edema of the rat uterus (Astwood, Pincus and Graubard, Lawson *et al* Wick and Powell) have been used as biologic standardizers of estrogenic products. The early gain in weight of the uterus in response to estrogen therapy has been shown to be due to increase in water content followed by protoplasmic growth (Reynolds, Kneer Grumbrecht and Looser). The edema of normal and toxemic pregnancies is the result of a similar phenomenon (Taylor *et al*). Estrogen causes a maximal hyperemia of the uterine vascular bed followed by a rise in uterine metabolism (oxygen consumption) and finally the initiation of uterine motility (MacLeod and Reynolds). Inflammation of the myometrium alone in the absence of ovarian hormones produces arrhythmic motility in uterine fistulas of the untreated ovariectomized rabbit. Estrin induced motility is rhythmic (Laufer and Reynolds). The highest oxygen consumption of uterine muscle occurs during estrus (Reynolds). Estrin is essential for uterine contractions and indispensable for parturition theoretically estrin administration in sufficient quantity should bring about labor. Under its control uterine contractions become increasingly co-ordinated and powerful as gestation advances. Until the latter part of pregnancy its influence is held in abeyance by progesterin, possibly also by prolactin. As uterine distention progresses, uterine contractions grow more forceful and efficient (Reynolds).

In castrate monkeys menstruationlike bleeding occurs after sudden discontinuance of a course of either estrogen or progesterone. When estrogen and progesterone are given simultaneously bleeding takes place if progesterone is discontinued even if estrogen is continued. This may be the natural mechanism of menstruation as the corpus

luteum waxes and wanes (Corner Engle Allen) The threshold for estrogen deprivation bleeding is below that for estrous growth and edema (Hartman *et al*)

In man as in monkeys estradiol is convertible to estrone and estrone to estradiol. Progesterone acts through the uterus, probably on the endometrium, to bring about estrone to estradiol conversion. Thus, the distribution of estrogens in the urine supplies an index of progesterone activity because progesterone carries the following reaction



to the right Progesterone partially protects estrogens against destruction, largely in the liver and thus permits greater use and excretion. The amount of estrogen in the urine represents a balance between production and destruction Estradiol is less active physiologically than estrone. Progesterone deficiency results in lessened conversion of estrone to estradiol, and causes the estradiol to estrone reaction to swing left, together with greater destruction of all estrogens. Progesterone deficiency exists during normal labor and delivery and thus it is possible that a precipitating factor in the onset of labor may be the consequent rise of the more active estrone (Smith *et al* Mallow Cohen *et al*)

Likewise between 8 and 24 days before labor a maximum efficiency in the production and conversion of estrogen and progesterone is reached. Between this zenith and the onset of labor a progressive change in steroid metabolism occurs distinguished by progesterone and estrogen withdrawal on account of a gradually diminishing rate of production and conversion and slightly greater destruction The onset of labor coincides with a sudden decrease in conversion and an increase in destruction Uterine contractions result in a rapid decline in the rate of estrogen and progesterone production and conversion and a rise in destruction. This has also been observed in a 5 hour period of labor artificially produced by rupture of the membranes (Smith *et al*) Maximal estrogen and progesterone excretion occurs from 8 to 10 days before parturition (Hain)

The diminished production of progesterone as term approaches (Lyon) may be due to placental senescence (Ivy) although placental reserve is more than sufficient to maintain manufacture at normal levels (Mandel *et al*) In contrast to these reports, a gradual rise of estradiol, estrone and progesterone excretion during the last weeks of pregnancy has been noted (Browne *et al* Venning

Bachman Hain) The precise relationship of autacoid metabolism to the onset of labor has yet to be determined however (Reynolds)

Progesterone facilitates the metabolic conversion of estrogens and hence lowers their rate of inactivation. Estrogen inactivation products help stimulate sex steroid secretion. The output of progesterone during the luteal phase of the menstrual cycle and about the thirty-eighth week of pregnancy is sufficient to reduce estrogen inactivation enough to remove the stimulus for sex steroid secretion. Stilbestrol stimulates progesterone secretion in human pregnancy as shown by its administration in a pregnant diabetic who had daily urinary pregnandiol determinations. A regimen of oral stilbestrol may prevent abortion, premature delivery pre-eclampsia eclampsia, or intrauterine death which may be due to progesterone deficiency (Smith *et al*)

Estrogens administered to pregnant women have an oxytocic effect which mounts as pregnancy advances, but no reaction takes place before the twenty-ninth week Uterine tonus and other characteristics of uterine contractility are intensified (Abarbanel, Effkemann, Murphy) Theoretically large doses of estrogens should induce labor (Reynolds) but practically attempts to use this oxytocic property clinically or experimentally to produce early abortion almost invariably fail. Labor is induced successfully only when the fetus is dead as in missed abortion or missed labor, and then usually in conjunction with other oxytocic agents (Abarbanel Jeffcoate Rieckhof Streit Voron *et al*)

Estrus inhibition in the mouse during gestation is dependent upon the presence of progesterone equal to the concentration obtained when a dose of 15 mgm is given daily This is probably due to the production of progesterone by the placenta, because the amount of estrogen required to produce vaginal cornification in the pregnant mouse is greater than the amount required in the non pregnant one (Robson) Progesterone in high dosage does not inhibit parturition in the rat (Bunde) but abortion after the spaying of pregnant mice is prevented by progesterone (Robson) Removal of the corpus luteum in monkeys after the first month of pregnancy (Hartman) or in women on the fifty-eighth day after the last period (Jones and Weil) or on the eighty third day after the first day of the last period (Duyven de Wit and Oppers) does not result in abortion. The termination of pregnancy in the rabbit is dependent upon the termination of the life cycle of the corpus luteum (Snyder) Gestation in the rabbit may be prolonged indefinitely by progesterone

injections. The fetuses usually die after the thirty sixth day (normal length of gestation 30 to 32 days) and are large and post mature (Koff and Davis, Heckel and Allen).

Injection of estrogen on the eleventh and later days of pseudopregnancy in the rabbit effectively prevents regression of the corpus luteum which normally occurs on the sixteenth or seventeenth day. Parturition in the rabbit is prevented, in the presence of the ovaries, by injection of estrogen in the latter part of pregnancy. The corpora lutea are maintained and their presence is the cause of continued delay of parturition. Doses of estrogen sufficient to delay labor always result in fetal death (Heckel and Allen). In the rabbit placental senescence may cause a declining estrogen level near term which correspondingly results in a decline in the corpus luteum and labor (Heckel and Allen see Mandel *et al*).

The administration of daily doses of progesterone, estrone, estradiol benzoate or triphenyl ethylene (a synthetic estrogen) to pregnant rabbits hypophysectomized on the twenty-eighth or twenty-ninth day after mating results in prolongation of gestation and delayed labor. Fetuses are often expelled from 4 to 6 days after the normal time. The delay in parturition is probably due to maintenance of the corpora lutea, which are large and normal in appearance. In the normal intact rabbit daily administration of estradiol benzoate from the twenty-ninth day on is less effective in prolonging pregnancy. This is presumably due to the fact that hypophysectomy removes the posterior lobe as well as the anterior and thus removes the source of oxytocin (Robson).

Hysterectomy in rats at any stage of the sex cycle does not produce luteal persistence, but hysterectomy in pregnant rats results in maintenance of the corpora lutea. Some factor in the uterus is antagonistic to the corpus luteum and this factor is negated in pregnancy probably by the placenta because without the placenta the corpus luteum regresses (Hechter *et al*). Hysterectomy in rabbits on the tenth or later days of pregnancy is followed by a considerable reduction in the size of the corpus luteum, maturation of follicles, and estrus. Injection of estrogen for 10 days, after hysterectomy on the fifteenth day, forestalls completely the expected involution of the corpus luteum (Greep).

Estrone and progesterone are rapidly inactivated in the mammalian organism, largely in the liver (Zondek). Diethylstilbestrol is less rapidly inactivated (Zondek and Sulman). Hexoestrol may be used to advantage in place of stilbestrol, particularly in 'phase' therapy (Crotty *et al* Ivy

and Gray). Both men and women are chemical hermaphrodites because both produce male and female sex hormones (Frank).

Chorionic gonadotropin blood concentrations fall after from 60 to 90 days of pregnancy in man to low constant levels (Allen *et al* Kurrok, A.M.A. Best and Taylor). Pre-eclampsia and eclampsia are characterized by unusual amounts of chorionic gonadotropin in the blood serum, preceding clinical signs by from 4 to 6 weeks. In hypertensive and nephritic toxemias normal levels are found. The discovery of high serum anterior pituitary-like hormone concentrations in the fifth, sixth or seventh month warrants suspicion of impending pre-eclampsia or premature delivery. A rise in gonadotropic potency after the fifth month of pregnancy is followed by a diminishing production of progesterone and estrogen. This may reflect a declining utilization of chorionic gonadotropin for the elaboration of estrogen and progesterone. Deficiency of these two steroids results in a deranged metabolism of both, ending in less complete conversion and more rapid destruction. Such a shift exists at the onset of labor if it is present before term it is accompanied by pre-eclampsia or premature delivery (Smith *et al*).

Cyotrin or chorionic gonadotropin may be produced by culture of placental tissue (Jones *et al* Gey *et al*). The cells responsible are probably the Langhans cells (Gey *et al* Mandel *et al*). Prolan is similar in man and monkey (Hartman). In the rabbit in which luteal activity is present in the ovary throughout pregnancy the gonadotropic hormone content of the pituitary gland increases throughout gestation reaching a maximum only a short time before parturition (Robson). Follicle-stimulating hormone and luteinizing hormone of the pituitary gland (FSH and LH) injected into pregnant rats during the latter part of pregnancy inhibit parturition. Heavily luteinized mulberry types of ovaries are produced by both extracts. The fetuses live beyond term and are often abnormally large. Unfractionated pituitary extract elicits the same results. Pregnant mare serum produces large follicles as well as corpora lutea and does not prolong gestation or inhibit parturition consistently (Bonde). Human pregnancy serum injected into pregnant rats inhibits parturition and causes early death and resorption of the fetuses. It stimulates the ovaries intensely with formation of additional corpora lutea, follicular cysts, and occasional hemorrhagic follicles. These effects are most probably caused by gonadotropins present in serum and disappear within 72 hours after delivery or abortion. The gonadotropins in human pregnancy serum appear to differ quanti-

tatively and perhaps qualitatively from those in pregnancy urine extracts and pituitary gland extracts (Rosenfeld *et al.* see Ivy and Gray)

Chorionic gonadotropin (antuitrin-S) injections prolong pregnancy in rabbits as much as 15 days after injection, by maintenance of the corpus luteum. Heavy doses of pituitrin at term fail to bring about parturition (Snyder). Injections of human pregnancy urine extract in female albino rats after implantation prolong pregnancy and result in the birth of frequently viable but post mature fetuses (King). If 18 day old albino rat fetuses are crushed and the tissue extracts injected into the abdominal cavities of pregnant albino rats, such implants continue to grow. Fetuses in pregnant rats so treated develop normally attain maximum size, and die. No labor ensues. "It would seem then, that these embryonic implants also secrete a chemical substance which is similar to the prolactin contained in pregnancy urine and as a result the presence of this tissue in the body affects the gestation period in the same manner as the injection of pregnancy prolactin" (Taylor)

Certain members of the German school have presented evidence to the effect that the uterine enervating or 'laming' factor in man is chorionic gonadotropin rather than progesterone. Presumably prolactin also maintains the corpus luteum and brings about elaboration of progesterone by the ovary. In addition, chorionic gonadotropin acts antagonistically to extract of the posterior lobe of the pituitary gland upon the isolated uterus of the castrated rabbit and upon the uterus *in situ* (Clauberg Tsutsulopulos). Prolactin may aid progesterin in neutralizing the influence of estrin upon the gravid uterus (Reynolds). No mention of this action of chorionic gonadotropin is made by other workers in the field (Ivy and Gray, Robson, Allen *et al.* Kurzrok Best and Taylor A.M.A.). Clauberg's group and Tsutsulopulos believe that the effect of the falling concentration of chorionic gonadotropin during pregnancy is readily overcome by rising estrogen. Uterine muscle sensitization to blood oxytocin possibly pituitrin, then increases until labor ensues. This theory is not inconsistent with the observations of Smith and Smith and their coworkers.

Either testosterone or desoxycorticosterone substitute for progesterone in many ways in the female organism. In menstruation the anterior hypophysis alone is not directly or actively responsible for the initiation of the menstrual flow but acts synergistically with the ovarian hormones. Menstrual bleeding follows the cessation of ovarian hormones, as after castration. Withdrawal of either estrogen progesterone after estrogen, or

testosterone results in uterine bleeding in castrate animals. Either testosterone or progesterone prevents the bleeding of estrogen withdrawal. The endometrium of ovariectomized monkeys after testosterone injections which follow estrogen is clearly proliferative. When estrogen is followed by progesterone and a secretory endometrium is formed, testosterone maintains this luteal endometrium (Engle, Bartelmez, Allen, Engle and Smith Hartman). Testosterone propionate delays parturition in pregnant rats while the young are externally masculinized (Hamilton and Wolfe). Doca (desoxycorticosterone acetate) in sufficiently large dosage prevents estrogen withdrawal bleeding in mature spayed monkeys and may even cause progestational changes (Zuckerman, Hartman). Doca maintains pregnancy in rats castrated and adrenalectomized. In view of the hypertrophy of the adrenal cortex in pregnancy, it is possible that the adrenal gland plays an important role in the course of gestation (Kehl *et al.*)

The adrenals fluctuate in size over a period of time corresponding to the estrous cycle. The changes are independent of either the anterior pituitary lobe or the gonads because they persist after removal of these glands. The adrenal cortices of spayed rats injected with daily threshold doses of estrone undergo cyclical alterations in size every 5 days. This is an inherent rhythm because it occurs even after removal of the pituitary gland (Bourne and Zuckerman). Uterine bleeding occurs in spayed monkeys treated with oestrogens only when the intensity of stimulation falls below a certain threshold level. A daily threshold dose of oestrogen thus periodically becomes insufficient for maintaining endometrial growth. The obvious inference is that rhythmical fluctuations occur in the sensitivity of the uterus to oestrogenic stimulation or that some factor other than the ovaries also exerts an influence on the cyclical changes that take place in the endometrium. One suggestion was that cyclical alterations in the activity of the adrenal cortex may lead to cyclical hydration and dehydration of the accessory reproductive organs and that such changes could determine variations in the responsiveness of the organs to oestrogenic stimulation. No proof exists for this theory.

Another possibility is that the adrenal cortex produces a subthreshold amount of oestrogenic hormone itself the amount produced varying cyclically becoming less or negligible, at times corresponding to uterine bleeding. The amount of effective oestrogen acting on the uterus of a spayed monkey injected daily with threshold doses of oestrogen would thus be the introduced

hormone supplemented by the oestrogen produced daily by the adrenals. Either source would by itself be insufficient to maintain the endometrium in a phase of growth, and bleeding would thus occur at times when the adrenal was not secreting any oestrogen. It is known that estrogen can be extracted from the adrenal cortex.

A third possibility is that the adrenal cortex cyclically produces, at times of intermenstrual bleeding, androgenic and/or progestational hormone, and that this endogenous hormone neutralizes the effect of the introduced oestrogen at those times. Alternatively such hormone may be produced continuously but in amounts which vary cyclically. Both of these hormones can be extracted from the adrenal cortex (Bourne and Zuckerman).

It is impossible to elicit artificial estrous cycles in spayed and adrenalectomized rats injected daily with constant doses of adrenal cortical hormone and estrone. Artificial threshold estrous cycles in spayed rats still occur after hypophysectomy. The extravarian factor which cyclically alters the estrogen threshold of the reproductive organs is probably the adrenal cortex (Zuckerman, Bourne and Zuckerman). Periodic uterine bleeding is evoked in spayed rhesus monkeys injected daily with a constant threshold dose of estrone. One of 5 animals thus treated has experienced an artificial threshold cycle after hypophysectomy (Zuckerman). Elicitation of artificial threshold estrous cycles is dependent upon the presence of the adrenals, and their influence upon the cyclical changes which occur is a direct one (Bourne and Zuckerman).

Similar findings have been reported in the production of cyclic vaginal changes in castrate rats, in which adrenalectomy immediately produces prolonged estrus (DiPaola). In parabiotic rat pairs consisting of a castrated male and a hypophysectomized female, the female exhibits continual estrus, with cornified cells in the vaginal smear. Testosterone or estrone injections into the male castrate partner of such a pair causes cyclic variations, in the vaginal smear from the hypophysectomized female as in a normal estrous cycle (Cutuly and Cutuly). In this connection normal cyclic ovarian changes have been observed recently in the vaginal smears from an artificial vaginal mucoea (Ayre).

A rhythmic rise and fall in estrone, estriol, and pregnandiol excretion prior to labor has been observed in the human. The controlling stimulus for this rhythm may be responsible for the onset of labor. However no connection exists between hormone analyses and the onset of labor because the latter may take place equally at the top or at

the bottom of a rhythmic rise and fall in hormone excretion (Hain).

The foregoing discussion of inherent physiologic rhythms, in which the adrenal apparently figures, brings to mind the older theories relating the rhythmicity of the menstrual cycle to the final onset of labor (Williams-Stander Stander DeLee, DeLee and Greenhill). 'Pregnancy is composed of a series of cycles.' Variations in the gestation periods of a species are such that the average gestation period may approximate a multiple of the (sexual) cycle (Snyder).

Numerous attempts have been made to determine the cause of the onset of labor by means of parabiosis in pregnant animals (see Schmidt). According to Sanderbruch and Heyde, if one rat of a parabiotic pair becomes pregnant the partner has tetanic seizures, suggestive of uremia, if it is either a male or a nonpregnant female. Whereas if the partner is a pregnant female it goes into labor whether at term or no and may abort or deliver. On the other hand, according to Kross, when both partners of parabiotic pairs are pregnant both proceed to term normally and labor in one partner does not affect the course of gestation in the other. Based on the experiments of the German workers, a theory of labor has been evolved in which an antigen-antibody reaction is assumed to occur as in anaphylactic shock. Fetal antigen reacting with maternal antibody forms an anaphylotoxin which causes uterine contractions. A gradual sensitization of the mother by fetal toxins takes place, with the onset of labor due to sudden intoxication by a large dose of fetal antigen. The anaphylotoxin is presumably the labor inducing body (Von der Heide). The intravenous injection of serum from women in labor into pregnant and parturient women elicits shocklike reactions or labor pains, according to von der Heide. However, the experiments of Kross on parabiosis and carefully controlled experiments on the pregnant guinea pig and pregnant women near term by Kolmer fail to substantiate the anaphylactic theory of labor.

The earlier reports of Levine and others, notably Hunt, on the relation of the Rh factor to repeated miscarriage or abortion should be mentioned in this connection because of the similarity of the Rh mechanism to the earlier anaphylactic theory. In a recent report, however, Hunt states that the Rh factor is not of great importance as a common cause of repeated miscarriage or abortion and becomes operative only in the latter half of pregnancy. Endocrine deficiencies of function are probably of more importance in habitual abortion than the Rh factor (Hunt).

Final summary and conclusions 'Emptying of the uterus is under hormonal control (Snyder) It is probable that progesterone and estrogen blood levels increase toward term. The decreased excretion preceding parturition reported by certain authors may represent increased utilization. Other authors, notably Browne *et al.*, Venning Hain, and Bachman, report no such drop in excretion levels. Hain remarks upon the individual variations prevalent in his series of cases.

The synergistic co-operation of the sex steroids causes increasing uterine activity during gestation. At optimal uterine distention with uterine muscle irritability at its highest point and aided by expanded calcium ionization blood concentration of the posterior pituitary secretion reaches threshold levels and brings about the onset of uterine labor contractions. Labor contractions are characterized by (1) appropriate magnitude, (2) rhythmicity (3) similarity (4) high tonus, (5) co-ordination and (6) effectiveness. Retraction of the uterine muscle, cervix, and lower uterine segment is inherent in the labor mechanism.

Likewise, it is probable that posterior pituitary secretion is continually present in the blood during pregnancy, but reaches uterine threshold concentration only at term. Labor ensues beyond the physiologic threshold of uterine muscle. If distention is close to the optimum, the blood progesterone and estrogen at a high level, the pituitary secretion at effective levels or any combination of these, the threshold may be exceeded before estimated chronological term. Both pitressin and pitocin may be normally present and physiologically active in total posterior pituitary secretion concentration in the blood so that artificial distinctions between them may be interesting experimentally but unimportant physiologically. It is possible that inherent physiologic rhythms (adrenal) provide a trigger mechanism after a certain multiple of the sex cycle has been exceeded. Theoretically then, it should be possible to initiate labor in the pregnant primate at will, using synthetic sex steroids and posterior pituitary extract to duplicate physiologic endocrine relationships. A clear cut and complete description of the precise physiology and etiology of the onset of labor in the primate may be expected in the future.

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ABSTRACTS OF CURRENT LITERATURE

SURGERY OF THE HEAD AND NECK

HEAD

Marwell, J. H.: Chronic Proliferative Osteomyelitis of the Skull. *Ann Otol Rhinol* 1946 55 719

The author reports a series of cases of chronic proliferative osteomyelitis of the skull in which the tumor progressed to the point of simulating tumor formation or causing pressure symptoms. These he differentiates from osteoma or true bone neoplasm.

Chronic proliferative osteomyelitis is present in some degree in every case of chronic inflammation within pneumatized bone. This proliferative tendency of osteogenic tissue is dependent upon the conditions of stimulation. In early chronic proliferative osteomyelitis osteoid and pyogenic granulation tissue may be present later however, normal appearing bone trabeculae with only fibrosis of the marrow spaces may predominate. The diagnosis rests upon a combination of clinical, radiographic and histopathologic findings.

Thirteen case histories with roentgenograms are presented. Eight cases fitted the picture of chronic proliferative osteomyelitis in 6 of these the condition was apparently due to infection in 3 it was possibly related to trauma. In 6 cases the lesions were in or about the paranasal sinuses in 1 case, the mastoid, and in 1 the mandible. The remaining 5 cases were classified as fibro-osteoma. In the cases of fibro-osteoma, the presence of atypical bone trabeculae and atypical fibrous connective tissue in the marrow spaces reveals the true identity of the lesion. The treatment of chronic proliferative osteomyelitis consists in complete surgical removal of the newly formed bone.

Fernández, J. R., Corneillas, M. F. and Laconzo González, J. M.: Eosinophilic Granuloma of the Frontal Bone (Granuloma eosinofílico del frontal). *Radiología* B. Air 1946 9 34.

The third case of eosinophilic granuloma in the Argentine is here reported. Altogether there have been only about 30 cases reported for the entire world. A 14 year old boy with a frank history of allergic manifestations, consisting of rhinitis and pruritus of the right eye from eating peanuts suffered sudden intense pain in the right superciliary region, accompanied by edematous swelling of both eyelids. The pain was exaggerated by palpation. The condition was not changed by either the sulfas or by penicillin. Roentgenologically there was evident an osteolytic, nonreactive area of the right frontal bone, involving the orbit on that side about 3 cm. in diameter. The borders were sharply

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delimited but irregular as though the result of a number of extensions of the process. Incision under local anesthesia transversally within the line of the eyebrow disclosed a soft, exquisitely painful mass which did not give to the curette any sensation of bony structure. Subsequent roentgen therapy brought about not only a cessation of the pains and a recession of the tumefaction and a swollen gland which had appeared at the angle of the jaw but roentgen examination 3 months later showed not only a reduction of the osteolytic area but in addition an osteogenic reaction which seemed to be progressively filling the pre-existent cavitation.

Histological examination disclosed the preponderance of eosinophilic histiocytes, both of adult forms with bilobulated nuclei and of young forms with spherical or oval nuclei. In places there were rare cells of large size, at times enormous with huge or bilobed nuclei and a finely syncytial chromatin characteristic of histiocytes. No evidence of the Hand-Schneider-Christian syndrome was noted (absence of exophthalmos, diabetes insipidus and lipodystrophy).

EYE

Sheppard, E. A. W. and Romejko, W. J.: Gonioscopy. *Am J Ophthalm* 1947 30 139

This article presents a simple technique of low magnification gonioscopy and shows the findings of examinations made by this method. It is primarily intended for the beginner because the low magnification makes it easier to orient the landmarks of the angle. The examination is made with the patient in the prone position and under pontocaine anesthesia. The gonioscope is inserted under the lid margin and the saline solution is then instilled between the lid and the cornea. Examination of the angle is made with an ordinary loop and with the illumination of an ophthalmoscope from which the head but not the condensing lens has been removed. In examining the normal eye the start is made at the pupillary border of the iris which is followed back to the "last roll of the iris." Usually a darker band can then be seen—the ciliary portion of the iris. Beyond this may be seen the fine strands of the pectinate ligament. The trabecular spaces are identified by a more or less pigmented dotted line. Above this is the corneal endothelium underlying the lamellae.

The authors list many conditions in addition to glaucoma in which gonioscopy is indicated the most common of these are the congenital anomalies the traumatic and inflammatory conditions the tumors the pseudotumors, and the cysts. Four traumatic cases were reported in which they found iris prolapse

traumatic ciliary dialysis peripheral anterior synchiae iritis deposits on the corneal endothelium, iris holes, and small foreign bodies in the angle. They also reported their findings in glaucoma and a leucomyoma of the iris, and noted that tremor of the iris is more magnified when looked at in the plane of the iris as in gonioscopy. ROBERT H. JOHNSON, M.D.

Schlaegel, T. F., Jr.: Histopathology of Atomic Bomb Casualties. *Am J Ophth.*, 1947 30 7

The author investigated the ocular histopathology of some Nagasaki atomic bomb casualties. He points out that disintegrating products of plutonium fission consist of fission fragments, neutrons, and beta particles, while the remainder are transformed into heat, gamma rays, and radiant energy such as ultraviolet visible, and infrared radiation.

The radiation sickness is similar to that which accompanies heavy total body irradiation. Its effect on the bone marrow results in aplastic anemia, fever, malaise, loss of appetite, bleeding gums, and hemorrhagic diarrhea. Irradiation of the entire body with 500 roentgens will kill. At Nagasaki there were 473 roentgens per sq. cm. at 1550 meters from the point where the bomb was dropped.

Sections of eyes were made of patients who had succumbed from the effects of the Nagasaki atomic bomb irradiation 1 month after the bombing.

Damage to the cornea and lens by radiation was the only direct injury observed. The cornea and lens were denuded but there was evidence of epithelial regeneration. It was indicated by the presence of small vacuoles in the superficial cortex and thickening of the posterior capsule that the lenses were probably developing regenerative cataracts. None of the characteristic histopathologic features of the effects of radiant energy on general body tissues was observed (giant and irregular nuclei, hyaline connective tissue and thick walled hyalinized blood vessels).

In addition to the histologic changes attributed to direct irradiation the following were attributed to the patient's systemic condition: serous exudation into and from the ciliary body; invasion of the eye by bacilli; septic choroiditis; nodular cellular infiltration of the retina; fibrin nets on the surface of the retina; and in 1 case, distention of all the ocular vessels by white chiefly mononuclear cells.

JOSEPH ZUCKERMAN, M.D.

Scholz, R. O., and Woods, A. C.: Relapsing and Chronic Ocular Lesions following Mustard Gas (Dichloroethyl Sulfide) Burns. *Arch. Ophth.*, Chic. 1947 37 39

The author reviews 136 cases of chronic and recurring mustard gas burns of the eyes (including 84 cases reported by Mann). The lesions were usually found to be bilateral, involving mostly the exposed palpebral aperture. There appeared to be slow but steady progress in serious visual loss in these cases.

No satisfactory treatment has been reported. The methods of treatment suggested included curettage

of the corneal tissue and tarsorrhaphy. A fair trial of corneal transplantation has not been completed. Contact lenses have proved useful in some cases.

HOWARD H. ROMANET, M.D.

Speweth, E. B.: The Marcus Gunn Phenomenon. *Am J Ophth.* 1947 30 43.

The Marcus Gunn phenomenon, congenital ptosis with an associated jaw-winking reflex, is found in approximately 1 per cent of all cases of congenital ptosis. The same condition in the acquired form of ptosis is known as the "pseudo-Gräfe syndrome." There is essentially an intermingling or misdirection of developing fibers of the third and fifth cranial nerves. There is a rather complete discussion of the various theories in the original article, but the conclusion is not very satisfactory.

In some of the cases there was a possibility that associated reflexes might have been the result of an afferent proprioceptive reflex pathway and a sympathetic efferent pathway. Other cases may have had brain stem internuclear pathologic, anatomic connections as the cause of the associated reflex. In still others the origin may have been in the supra-nuclear higher cerebral centers.

Surgical intervention was undertaken in several cases with a satisfactory result. An intracranial approach does not appear to be necessary.

WILLIAM A. MARKE, M.D.

Givner, J. Bruger M., and Lowenstein, O.: Exophthalmos and Associated Ocular Disturbances in Hyperthyroidism. *Arch. Ophth.*, Chic. 1947 37

Marine and his associates concluded that the sympathetic centers in the midbrain played a part in the production of exophthalmos, and Lowenstein has shown that pupillography can show evidence of central sympathetic disturbances. Therefore 22 patients with hyperthyroidism with and without exophthalmos were studied by this method. All but 1 showed a redilatation block which was interpreted as evidence of central sympathetic disturbance and therefore tended to confirm Marine's conclusion. Five patients without hyperthyroidism but with unilateral exophthalmos were examined in this manner and were found to have normal pupillary curves. More cases of this type must be studied before the value of pupillography in the diagnosis of unilateral exophthalmos can be established.

Since Mulvaney contends that the immediate cause of exophthalmos whether it be of the thyrotoxic or the thyrotoxic type resides in the extraocular and smooth muscles of the eyeball Tenon's capsule and the lid it was thought that the drugs used in the treatment of myasthenia gravis atony of the bladder and intestinal walls, and of muscular dystrophies may be of help in this condition. Consequently neostigmine bromide was tried in 5 patients with exophthalmos due to hyperthyroidism, but the results were unsatisfactory. Vitamin E and pyridoxine hydrochloride were also given without reduction of the

exophthalmos while ergotamine tartrate only temporarily narrowed the palpebral fissures. Oral administration of iodine reduced the exophthalmos in 3 patients and the authors noted 1 case in which the exophthalmos receded as pregnancy progressed. They reported a case of bilateral malignant exophthalmos with central scotomas and a bitemporal contraction. A Naffziger operation was done with removal of the upper part of the optic foramen on the right side but not on the left. The authors believed that this could have accounted for the recovery of the vision in the right eye and the almost complete loss of vision in the left eye.

ROGER H. JONKSON, M.D.

Goldsmith J.: A New Modification of the McReynolds Transplantation for Pterygium. *Arch Ophth Chlc.*, 1947 37 194.

The author suggests an explanation for the recurrence of the pterygia treated by the McReynolds transplantation technique and offers a new modification of that operation.

In the McReynolds transplantation operation a black silk suture is passed through the freed head of the pterygium and then through a subconjunctival tunnel to emerge from the conjunctiva. When the suture is tied the head of the pterygium is transplanted against this loose subconjunctival tissue. The author believes that this does not form a firm adhesion and that this adhesion may be disturbed or broken on removal of the black silk suture. He believes that if the retraction pull of the pterygium is sufficiently powerful it is not long before the head and neck of the retracted pterygium align themselves in the horizontal meridian to begin an invasion of the cornea again.

To prevent this retraction he has modified the McReynolds transplantation operation. The head of the pterygium is freed in the same manner the bulbar conjunctiva is undermined toward 6 o'clock in a narrow strip, and another incision through the conjunctiva and Tenon's capsule is made 5 mm. below the limbus. A double armed ovoid chromic surgical gut suture is introduced into the head of the pterygium from without inward and is pulled through the conjunctival tunnel and out through the lower incision. The needles are passed through the episcleral tissue and Tenon's capsule about 3 mm. apart. The head of the pterygium is then drawn through the tunnel and the suture firmly tied. The author believes that the pterygium head will then remain in place because of the attachment to a firmer tissue and because removal of the suture is unnecessary. He has had fewer recurrences of pterygia following this method.

ROGER H. JONKSON, M.D.

Grossmann, E. E.: The Stability of Penicillin in Ophthalmic Solutions. *Ak Ophth Chlc.*, 1947 37 167.

There has been considerable discrepancy in the reports on the stability of penicillin in solution or ointment form. An attempt was made to determine the

stability of penicillin in various vehicles both clinically and in the laboratory. White ointment was compared with isotonic solutions by means of a seeded agar plate and repeating every fourth day. There was extreme loss of potency in all samples after the fourteenth day. A cod liver oil suspension gave the same results, but an olive oil suspension retained 65 per cent of the potency of the penicillin after 21 days.

The stability of penicillin in blood plasma and human serum was studied and it was believed that these solutions gave the best results. The blood plasma appeared to give the best results and also to be more stable, with less turbidity and mold growth. It was noted that clinically good results could be obtained when the potency of the penicillin was considerably reduced as an extremely high concentration was not necessary in most cases when used locally in the eye. However, it should be used frequently that is, every hour or every 2 hours to maintain contact with the tissues.

WILLIAM A. MANN, M.D.

EAR

Fowler E. P.: Symposium on Noise, The Percent age of Capacity to Hear Speech and Related Disabilities. *Laryngoscope* 1947 57 103.

The author discusses the difficulty in measuring the binaural percentage loss of capacity to hear speech. He describes briefly his method which he suggested 5 years ago and which, he believes, should be accepted as standard for use in the Army Navy and Air Corps. He discusses the reasons why his method was not accepted by the Committee on Audiometers and Hearing Aids of the American Medical Association. He also discusses the method that was accepted and compares his own method with the other methods. He offers several changes that could be made in the existing method so that it would give results which correspond approximately to the results obtained by him. His discussions are quite long and complicated and anyone that is interested in this subject is advised to read the original article.

The author states that after obtaining a percent age of loss of capacity figure it was difficult to employ it in determining the disability suffered. This is true because no 2 people react the same to the same stimulus or to the same handicap or to its suddenness or rate or progression. In determining the handicap the prognosis of the hearing and the operative age would come into the picture. The handicap is less if the prognosis is favorable and if the patient can be helped by other means. Prognosis is a matter of clinical judgment and result of treatment. Operations are limited to favorable cases such as those with uncomplicated otosclerosis.

Hearing aids are useful in obstructive deafness even when complicated by severe neural lesions but not in total or near total deafness.

All these things being taken into consideration, it seems apparent that the degree of disability must be

determined in the courts using the percentage of hearing capacity as a basis for calculation, but only as a basis. The ability to overcome a handicap is often of greater importance than the handicap itself. Each case must be considered individually because the problem is never exactly the same in any 2 persons.

WILLIAM A. ARKROW, M.D.

Hoople, G. D., Wolfe, W. C., and Bregande, S. C.: Symposium on Noise. Unrecognized Battle Noise Trauma. *Laryngoscope*, 947-57. 5.

There have been many articles in the literature regarding the loss of hearing acuity following exposure to noise. From these studies it has been recognized that some individuals have a greater tolerance for noise than others. The authors became interested in the effects of battle noise on the ears of exposed soldiers who gave no complaint of deafness.

To determine whether or not there is any actual trauma to these soldiers exposed to noise, but without complaints, audiograms were made on 1,500 soldiers who had been in active combat but who had no complaint of hearing loss. It was impossible to determine the duration and degree of exposure to battle noise for each soldier. To obtain some comparable audiogram for a control series, 150 soldiers who were never exposed to combat were also examined. The composite audiogram of the 1,500 battle-exposed soldiers showed some loss throughout the entire range over the controls with the characteristic high tone loss beginning at the 2,000 level. A number of the soldiers stated that they had suffered a temporary hearing loss some time during the exposure but each maintained recovery of this loss by the time of the examination. The audiograms in a large percentage failed to show a correlation between the side of greater hearing loss and the side on which it was maintained that the explosion had occurred. A large number of the 1,500 soldiers complained of tinnitus, but no record was kept of this group and detailed questioning on symptoms was avoided so as to avoid any fixation in this regard. However when tinnitus was a complaint, audiometric loss of some significance was usually demonstrated. The records of 1,000 of the 1,500 exposed soldiers were studied in greater detail and divided into several categories.

In category 1 the soldiers were divided into two groups, those under 30 years of age and those 30 years of age or over. There were 20 in the second group and 790 in the first group. The difference in the audiometric readings in these two groups was hardly significant and any difference could be laid to the difference in age rather than to any greater susceptibility of the soldiers more than 30 years of age. There seemed to be sharp evidence that a soldier over 30 is liable to greater audiometric injury to noise than a soldier under that age.

In category 2 the 1,000 soldiers were divided into two groups and studied by means of a Seigle's speculum. The two groups were those showing normal motility of the ear drum and those with restricted motion of the ear drum. The latter of the two groups

gave some evidence of previous inflammatory lesions in the middle ear which had resulted in some adhesions. Roughly about 21 per cent showed limitation in motion of the drum or malleus. There was an appreciable, but not significant, difference between the two groups. It could not be determined whether or not middle ears with evidence of previous disease were more susceptible to noise trauma. One can only say that diseased ears were as susceptible as normal ears.

In category 3 the soldiers were divided into two groups, those exposed to battle before October 1, 1944 and those exposed after that date. That was done because there was greater concentration of gunfire in the earlier stages. There was no appreciable difference seen between the two groups, probably because the cochlear damage sustained in battle is the result of very intense noise of short duration rather than prolonged noise of less intensity.

A fourth category separated the soldiers who had fought with the infantry from those in the armored divisions. Comparison of these two groups showed that those in the infantry showed a slightly greater hearing loss than those in the armored divisions. It is believed that this difference may be due to the fact that those in the armored divisions had their ears protected somewhat by the wearing of earphones and football type of helmets.

Category 5 divided the 1,000 soldiers into another two groups, the first including those whose hearings in both ears was better than 30 decibels in each of the ten frequencies tested, and the second group including those who had 30 or more decibels loss in any one of the ten frequencies in either ear. The first group in this category showed an audiometric curve which approximated the curve of the so-called normal. Thus, in a rough way this separated the normals from the acoustically abnormal. In other words, it shows that 30 per cent of an average group of soldiers not complaining of hearing loss had as much as a 30 decibel loss in at least one frequency in their audiometric chart. In group 2 of this last category 70 per cent of the exposed soldiers showed a like deficiency. Thus, among the soldiers in a battle exposed group there were 40 per cent more who showed this audiometric deficiency than in the average nonexposed group. Thus, in a rough manner point out that a very appreciable number of soldiers who have been exposed to battle noise have a recordable degree of acoustic trauma. It is impossible without a previous audiogram to state fairly whether any given soldier is or is not the victim of acoustic trauma from the battle noise.

Because of the fact that 30 per cent of the so-called normal will have some hearing decrease, a more careful hearing test should be done on each individual on induction into the army. This would help to decide whether or not these particular soldiers have suffered any hearing injury during their army career as the audiograms taken on induction and discharge can be compared. It is also unknown whether or not the individuals in the different groups will have any effect

from the injury in 5 to 40 years hence. It is only an examination in the future of this series of cases if possible that could tell that fact.

WILLIAM A. ABRON M.D.

Sensory E. T : Symposium on Noise. A Study of Cases of Acoustic Trauma from a Comparison of Patterns of Deafness. *Laryngoscope* 1947 57 142.

In medicolegal cases it is frequently difficult for the otolaryngologist to differentiate between true and fancied acoustic injuries. There is often disagreement between the experts and the writer believes that if certain facts would be generally recognized, history, and comparison of audiograms of deafness produced by disease with those of deafness due to trauma will prevent much confusion. The author discusses deafness caused by skull fractures, concussion from blows on the head, concussion from blasts or excessive noise, concussion from the telephone receiver causing deafness and direct penetrating injuries.

In all of these cases, any deafness is immediate and in most instances the hearing improves following the injury while in some it may remain the same and in a few becomes worse, particularly if ear infection follows the accident. The writer states that if the plaintiff claims that his deafness was first noticed months after the trauma, he has no proper claim.

Along with the deafness is usually tinnitus, vertigo, and disturbances of equilibrium. The tinnitus may persist but the vertigo usually disappears although at times it may recur at a later date and be more disabling than any actual deafness that may remain.

In traumatic injuries to the ear drum much hearing impairment rarely occurs but it is usually worse if the ear drum is not ruptured. However if infection follows a ruptured ear drum, the hearing loss may be severe. Pain, tinnitus, and vertigo, but usually only slight deafness follows the accident and except for the tinnitus the symptoms disappear quickly. If the patient is not seen immediately after the accident and infection follows it may be difficult to state whether or not his difficulty was due to trauma or to a simple middle ear infection.

The author has seen no cases of ear trauma following the use of the telephone but he mentions many cases that have been reported in the literature. The writer has had no cases of blast deafness but he mentions several cases reported.

He states that it is difficult at times to differentiate between occupational deafness and slowly progressive deafness which is frequently encountered in older people. He mentions some conclusions that have been arrived at by Bunch concerning occupational deafness. As a rule the hearing loss is in high tones and occurs in the hearing range in the same area of the spectrum of the noise to which the ear was subjected. He discusses briefly several of the laws in the different States covering this problem.

He states that the only way that both the employer and employee can be protected is by having pre-employment audiograms done on those employees who are subjected to industrial noises and to reduce the noise of industry.

In deafness due to injuries to the head, it is frequently difficult to determine if or not the deafness was due to the injury. There has been much controversy throughout the years and the proper use of the x rays and audiometer will help to solve the problem. The writer believes that in the cases with a history of violent symptoms of labyrinthian disturbance, lessened response to vestibular tests and an audiogram showing perceptive hearing loss, the pattern of which does not conform to deafness caused by disease, indicate that the hearing loss has been caused by the accident. At times in certain cases of deafness no definite statement can be made unless a careful history eliminates exposure to noise.

In deafness following head injury there is usually a sudden drop in the high tones while perception of deafness caused by disease will cause a slowly decreasing curve in the high tones.

The writer includes a number of short case reports and shows numerous audiograms to illustrate the different types of deafness which may follow trauma.

WILLIAM A. ABRON M.D.

Simonton, K. M : Study of Acute Otitis Externa, with Special Reference to Secondary Myringitis, and Otitis Media. *Am Surg* 1947 13 136.

The present study is based on observations which were made in a period of 2 years in military hospitals in New Guinea and the Philippine Islands. Patients observed include both outpatients and hospital patients. In addition a review was made of the records in 341 consecutive cases in which the diagnosis of otitis externa was made. The patients were observed in New Guinea from May to September inclusive, which is the rainy season. At that time the incidence and severity of otitis externa is greater than during the relatively dry season.

From this study the following points seem worthy of emphasis.

Otitis externa is of frequent occurrence in the tropical islands of the Southwest Pacific probably because of the extremely high humidity. The condition is of military significance because of time lost from duty because of this disease.

Degeneration of cerumen in the external auditory canal is responsible for the primary infection in most cases.

Inflammation of the tympanic membrane occurs as a result of irritation from secretions in the external auditory canal.

Perforation of the tympanic membrane and infection of the tympanic cavity result from formation of ulcer on the tympanic membrane.

Thorough cleansing is the most valuable therapeutic procedure. Ointments and strong drugs are poorly tolerated. Intravenous administration of foreign protein together with the administration of one

of the sulfonamides or penicillin produced striking improvement in cases of severe otitis externa. No one regimen or drug has been used which is definitely superior to others.

Wells, F. L.: Superior Petrosal and Cavernous Sinus Thrombosis and Basal Petrositis Observed as a Complication of Destructive Labyrinthitis with Facial Paralysis. *Arch. Otolaryng. Chic.* 947 45 90.

The author describes one of the most interesting otological cases he encountered during nearly two decades of service at the Massachusetts Eye and Ear Infirmary Boston. He discusses at some length the management of paralysis of the left side of the face complicated by an acute exacerbation of chronic suppurative otitis media on the left side with mastoiditis and destructive labyrinthitis; the management of superior petrosal and cavernous sinus thrombophlebitis and supracochlear basal petrositis with destructive labyrinthitis and the management of meningitis as a complication of the thrombophlebitis and petrositis. The facts presented may provide objective experience for other otologists with similar difficult decisions. NOAH D. FABRICANT M.D.

NOSE AND SINUSES

Eisenstadt, L. W.: Management of Septal Deformities in Rhinoplastic Correction. *Arch. Otolaryng. Chic.* 947 45 77.

The author discusses the management of septal deformities in conjunction with rhinoplasty. A submucous resection either partial or complete, is advocated for about 80 per cent of cases in which a nasal plastic procedure is done. A submucous resection and rhinoplasty offer marked improvement and even cures in cases of mild or moderate vasomotor rhinitis. It is easier and more economical to perform submucous resection in conjunction with rhinoplasty than to do each at separate operations. If a curving in of the dorsal septum results from undue traumatism it should be immediately corrected by suturing the fractured ends together suturing the upper lateral cartilages together over the dorsum of the septum instilling a piece or pieces of resected cartilage or bone into the dorsum or by "pinning" the septum in place. It is always advisable to suture the submucous incision to prevent adhesions when septal resection is performed in conjunction with rhinoplasty. NOAH D. FABRICANT M.D.

Gatewood, W. L.: Improved Surgical Technique Based on Modifications of Jansen-Ritter (Lynch) and Caldwell-Luc Procedures for Chronic Sinusitis. *Arch. Otolaryng. Chic.* 947 45 4.

A striking impression gained from a broad survey of present-day literature pertaining to the management of chronic sinus disease indicates that efficacy is materially lessened by a lack of clear-cut agreement and mutual understanding among many of

those who are considered authoritative on this subject. While there can be no question as to the value of medical treatment as an adjunct to surgical treatment in chronic disease of the sinuses, certain of the older practices such as nasal suction, the use of tampons and irrigation can serve only as palliative measures. At the same time many who have become enthusiastic on the subject of nonsurgical treatment have clouded the issue by advocating pseudo-surgical practices, including physical and chemical therapy, that are of questionable value and claiming results that cannot be verified by clinical evidence.

This has been far from helpful to the somewhat isolated practitioners of medicine or surgery who frequently have the opportunity to advise or treat such patients. A natural corollary is a disastrous confusion in the minds of many which fosters delay and a fatalistic acceptance of what they have come to regard as the inevitable.

The sole rationale of procedure is placed firmly on an essential scholarship in the medical sciences of anatomy physiology and pathology. Too much emphasis cannot be placed on the great importance of studying anatomy on the cadaver thoroughly as a prerequisite to operating on the living subject. This experience is gained under proper supervision. A textbook knowledge of anatomy is important, but practical study of the subject in the anatomical laboratory is essential to a thorough understanding of surgical anatomy which is so necessary at the operating table.

A thorough clinical anatomy of the accessory nasal sinuses the nasal cavity and the septum is presented, along with 18 figures illustrating the technique and surgical procedure. With this technique the author accomplished complete removal of pathologic tissue the conservation of operative time, and the reduction of trauma of healthy tissues to a minimum. The function of the nose is left undisturbed, and intra-nasal inspection at any subsequent time encounters no gross evidence that operative procedures have been undertaken.

With the patient who has a history of long-standing chronic sinus disease and whose sinuses contain thickened membranes with irreversible degenerative changes not responding to nonsurgical treatment the only sound surgical procedure is the thorough removal of the membranes and any diseased bone that may exist.

Postoperative healing is obtained by the formation of a dense layer of fibrous connective tissue which becomes epithelialized as the mucous membrane of the nose grows into the sinus cavities.

Diplopia is seldom encountered, and in the rare cases in which it occurs, is only transitory. As to the facial appearance, esthetically speaking the incisional wound is not recognizable.

In subjects with extremely large frontal sinuses showing multifocal recesses and extending laterally to the zygomatic bone, an incision of greater extent will be required in the manner of the Killian procedure. JOHN F. DILLON, M.D.

Burnam C. F.: General Factors in Irradiation Therapy *Ann Otol Rhinol* 1946, 55: 764.

Burnam points out that irradiation can be used in advantage in a great many otolaryngologic and ophthalmologic conditions that it is simply a method of treatment, just as is a surgical procedure or the use of bactericidal and bacteriostatic drugs. Specialists in ophthalmology and otolaryngology should master the principles of ray therapy and either carry out the treatments themselves or have them carried out in the way that is likely to produce the best results. Initially practically all patients suffering from new growths and from various infections come to the specialist who is in a position to study and assess the value of therapeutic procedures. So far as beta ray applicators are concerned, their use is simple. With x rays and implantation, co-operation between a competent radiologist and a specialist is perhaps the best method of procedure.

NOAH D. FABRICANT, M.D.

MOUTH

Goodsell J. O. and Others: Fractures Involving the Mandibular Condyle *J Oral Surg* 1947, 5: 45.

This article deals with fractures of the mandible at a site above the mandibular notch and severing the articular head of the condyle from the ascending ramus. One hundred and twenty cases are reviewed by the Chalmers J. Lyons Club whose members made an excellent follow up study.

Although structurally the neck of the condylar process appears to be the point most vulnerable to mandibular fracture, clinical statistics reveal that only 8 per cent of mandibular fractures occur at this site. The apparent increase in the number of these fractures recently may be attributed to the growth of a hazardous mechanized environment.

The anatomy of the mandible is discussed thoroughly and its clinical application pointed out.

The fractures were classified as follows:

Displacement fractures (condylar head remains within the limits of the temporomandibular joint)

- Anterior
- Posterior
- Medial
- Lateral

Dislocation fractures (condylar head leaves the limits of the temporomandibular joint)

- Anterior
- Posterior
- Medial
- Lateral

The clinical signs of fracture of the mandibular condyle may be scarcely perceptible, and symptoms may be negligible or absent. Frequently roentgenographic findings are the first to disclose a condylar fracture. All degrees of signs and symptoms may be present and it is surprising to find that there is no constant correlation between the extent of fragment displacement and magnitude of clinical deformity.

In spite of marked displacement evidenced in the roentgenogram, there may be no occlusal imbalance or significant functional disturbance. Fractures with minimal displacement are usually unaccompanied by great deformity or functional disturbance. Clinically upon digital palpation of the anterior wall of the external auditory meatus an absence of normal excursion of the condylar head will be found on the side of fracture. Palpation at the preauricular fracture site may reveal crepitus during function. Gross displacement of the condylar head may be disclosed by palpation if it is not marked by edema. Preauricular pain may be manifest with an increase in tenderness during excursions of the mandible. In direct fractures, contusions, swelling and other obvious traumatic signs are found.

Disturbances in the occlusal relationship of the teeth is commonly present. The degree of trismus varies greatly.

The aims of treatment are restoration of normal function with correct occlusion, or interarch relations if the patient is edentulous and the elimination of the associated deformity. Reduction is accomplished by open or closed methods. Closed reduction is the preferred method, and when general anesthesia is used the best reduction is possible. Various types of intermaxillary fixation are employed and 3 weeks of immobilization are usually sufficient.

Although condylar fractures disturb the complex structure of the temporomandibular joint and theoretically would seem to raise havoc with jaw function the clinical studies of a large group show complete functional readjustment in nearly every case.

The aim of treatment is not the x ray evidence of fragment realignment in correct anatomic position as these fractures do well and attain satisfactory function without accurate realignment.

Surgical methods have few indications and many hazards. The handicaps and complexity of surgical intervention are discouraging. Open procedures introduce additional trauma and invite infection and dislocational complications.

Ankylosis was a rare complication.

In patients not skeletally mature no disturbances of epiphyseal growth occurred.

EDWARD R. DOKOSCHUX, M.D.

Provecho, M. C.: The Surgical Treatment of Epitheliomas of the Face and Buccal Cavity with Especial Reference to the Immediate Plastic Repair (*El tratamiento quirúrgico de los epitelomas de cara y cavidad bucal, con especial referencia a la reparación plástica inmediata*) *Rev espal cir.*, 1945: 453.

Metastases in cancer of the face occur in 1 per cent of the cases. Secondary growth may be found in distant organs. The mortality rate is relatively high and should be reduced because the location of the tumor is typical, easily accessible, and diagnostically simple.

Treatment on the other hand results in much pain and mutilation. This is brought about partly

by the application of therapeutic agents which are to be condemned. The application of nitrates, various caustic pastes, or carbon dioxide often results in unnecessary disfigurement and inadequate treatment. The collaboration of surgeon and radiologist is often disappointing because the treatment falls into a vicious circle. The radiologist has no opportunity to treat the surgical case when indicated and the surgical case is submitted to radium or x rays when neither is of value. The principal objection to surgery is that often a considerable amount of tissue has to be sacrificed, and much plastic repair has to follow if deformity is to be avoided.

The author presents the indications and methods of treatment to be employed in the various epitheliomas of the face and mouth. This therapy is based on experiences gained in the surgical section of the National Institute for Cancer in Madrid.

The principal indications for surgery are that the tumor is of large size, near the bone or cartilage, radioresistant, recurrent or precancerous in type. When metastasis has occurred to the lymphatics these should be removed at the time of operation.

Surgery is contraindicated when the lesion is reasonably incurable, the general condition of the patient is bad, or infiltration has extended to the deeper glands.

Immediate plastic repair with various types of grafts is emphasized. Diathermy coagulation and extirpation is resorted to when indicated particularly in the recurrent type of tumor and extension of growth into the craniofacial bones requires special consideration according to the bones involved.

STEPHEN A. ZUCKMAN, M.D.

NECK

Sweet, R. II: Pulsion Diverticulum of the Pharyngoesophageal Junction: Technique of the One-stage Operation. *Ann. Surg.* 947 254

The author reviews the technical details of the earlier one-stage method for excision of diverticula

of the pharyngoesophageal junction, and suggests the reasons for the difficulties which were encountered.

Early attempts to perform the entire operation in one stage led to discouragement as a result of the frequent occurrence of deep cervical or mediastinal infection and the development of fistulas. To avoid these difficulties the author adopted the two-stage technique which minimized the complications to a large extent, but did not prevent the occurrence of the occasional fistula. Though this represented a definite improvement he believes that by observing certain refinements of technique described in the article, and taking advantage of the protection against infection which results from the prophylactic use of penicillin and sulfadiazine, it is possible once more to resume the use of a one-stage procedure with its resulting advantages and the saving of approximately 2 weeks' hospitalization.

The author describes the principles of technique, viz. a minimum of handling and trauma, accurate dissection, proper care in placing sutures, such as (1) avoidance of damage to cut-edge, (2) securing an accurate layer-by-layer approximation of the edges, (3) insurance of an adequate blood supply and avoidance of the use of a drain or lying tubes in the esophagus. The preliminary preoperative preparation with penicillin and sulfadiazine is given, followed by a description of the actual technique of operation, the use of intratracheal anesthesia (ether) the method of approach, and the manner of removal of the diverticulum. The author avoids the old idea of tying the diverticulum at its base and inverting the stump into the wall of the esophagus, by cutting it at its base and the resulting defect is closed in two layers with interrupted fine silk sutures, thereby substituting a neatly closed vertical incision for the bunched-up wall at the site of inversion of the tied-off stump. The postoperative management is then described.

The average hospital stay in 5 such cases was 11 days.

G. ALLEN LIVA, M.D.

SURGERY OF THE NERVOUS SYSTEM

BRAIN AND ITS COVERINGS CRANIAL NERVES

Mount L. A.: Premature Closure of Sutures of the Cranial Vault—A Plea for Early Recognition and Early Operation *A. J. Surg.* 1947 47 370.

Premature closure of any one or more of the sutures of the cranial vault results in marked abnormality in the shape of the skull and hence of the brain. Early closure of the sagittal suture results in a long narrow skull closure of the coronal sutures in a broad short and occasionally high skull and closure of both coronal and sagittal sutures in a high skull. Illustrations of each of the various types are presented.

Surgical treatment is discussed and the author relates views briefly the operative techniques of Sharpey, Cushing, Bauer, Keegan, Faber and Towne and others. He contends that since the symptoms and signs result from closure of the suture opening of the closed suture should be the best treatment. Accordingly a strip of bone from 6 to 10 mm. in diameter was removed at the suture which opened it in its entirety. No significant bleeding from the sagittal sinus was encountered. The dura separated readily from the bone beneath the closed suture.

Six case reports are described, 4 involving the sagittal suture and 2 the coronal. The youngest patient operated upon was 3 months old and the oldest 24 years old. The best results were obtained in the patients in whom the operation was performed earliest. None of the patients had signs of increased intracranial pressure either before operation or subsequently. Two who were retarded mentally were still retarded 22 months and 4 months, respectively after the operation. In 3 of the patients it appeared that a new suture line with interdigitations developed. It appeared from roentgen examination that the suture was normal and thus far it has remained open in both cases for 18 months after operation. In 2 other cases a thin layer of bone representing only the outer table had bridged the defect. Early recognition of closure of the suture and early operation is necessary in order to obtain the best results.

HOWARD H. LANKER, M.D.

Amyot R.: A Contribution to the Study of Lipoma of the Corpus Callosum (Contribution à l'étude du lipome du corps calleux) *Union méd. Canada* 1946 75 1391.

The author presents a case of lipoma of the corpus callosum, discussing its diagnostic signs and symptoms and differentiates it from agenesis of the corpus callosum and septum pellucidum cysts.

The patient had severe headaches since childhood and convulsive seizures but no other localizing symptoms. The diagnosis was made by means of roentgenograms of the skull and pneumocephal

ographic studies which showed dilated anterior horns and lateral ventricles separated by a round mass with a calcified capsule. Removal of the tumor produced a right hemiplegia and marked distrust of the frontal lobe.

The author advises against operation as the surgical sequelae were worse than the preoperative symptoms of this benign congenital neoplasm.

GEORGE PERRET, M.D.

Gregori A.: Meningioma in the Mastoid (Meningioma nella mastoide) *Radiol. med., Milano* 1946 33 395.

The author presents a case of meningioma in the mastoid and discusses it from the point of view of roentgenological differentiation. He finds no reports of such cases in the radiological literature.

The case was that of a male 42 years old who 2 months after an attack of otitis media which cleared up in 10 days suffered retroauricular pain followed by the appearance of a tumefaction in the right mastoid region. The swelling was elastic but not fluctuating and disappeared completely after 10 hours. The same phenomenon occurred 10 days later and this time the tumefaction persisted 18 hours. The patient entered the hospital and roentgen ray studies revealed the right mastoid region to be occupied by a transparent area, round, sharply outlined about 2 cm. in diameter with millet seed sized bony transparent areas scattered in a cloudy center. The apex of the bone was normal. In the differential roentgen ray diagnosis the author considers 1. Normal mastoids with single transparent cavities as reported by Steurer. The author's case differed because the lacuna was large and the polygonal characteristics of the mastoid cells had disappeared completely.

2. Acute mastoid with abscess formation. Here the lacuna may be as large as in the author's case but the outline is cloudy and there may be rarefaction of bone as well as small sequestra.

3. Cholesteatoma secondary to chronic otitis media. Against this diagnosis were the absence of eburnation of the mastoid, the location of the bony defect which normally occurs in the antrum and in the attic, the normal appearance of the tympanic membrane and the normal acoustic studies discarding the possibility of a tubercular process, actinomycosis or gumma.

4. The anamnesis and serological studies discarding the possibility of a tubercular process, actinomycosis or gumma.

5. Cyst. This is preceded by otitis media early in life, followed by alteration or destruction of the anatomical constituents of the ear and loss of hearing.

6. Neoplasm primary or secondary. Steurer (Henke Loharsch) Mayer have described such cases but the lacuna is irregular and not sharply outlined.

7. Primary cholesteatoma of the mastoid due to the presence of embryonal cells in the temporal bone, described by Amersbach as epidural cholesteatoma or mucocoele of the mastoid cells. Roentgenologically this is very much similar to the condition in the author's case but the clinical picture is very different.

8. Benign tumor. The author's case might have been a benign tumor but he was unable to explain the alteration of the mastoid as a consequence of such tumor. Surgical intervention revealed a large cavity 3 mm. from the bony cortex, filled with gray tissue and waterlike fluid. This neoplastic mass which was attached to the dura of the middle cranial fossa was removed and histological examination revealed it to be connective tissue. A tumor of this type was named "meningioma" by Cushing. Meningiomas originate from endothelial arachnoid cells enclosed in the dura mater are somewhat prevalent along the sinuses, and communicate with the dura of some of the cranial nerves. The author's case could be classified an endothelioma, as this often occurs in the petrous bone and clinically gives the symptoms and signs of an endocranial tumor.

JOSEPH M. A. PARR, M.D.

Kubanyi A.: The Treatment of Trigeminal Neuralgia by Intracranial Coagulation of the Gasserian Ganglion (*Sur le traitement de la névralgie du nerf trijumeau par l'électro-coagulation intracrânienne du ganglion de Gasser*). *Lyon chir.* 1940, 4, 68.

The author opens with the statement that when comparisons are made of the efficacy of various methods of treatment for any one disease, those treatments longest in use usually show up in a more favorable light than the newer treatments. He believes, however, that the relatively new operation of coagulation of the gasserian ganglion for the treatment of trigeminal neuralgia, first propounded by Kirschner in 1931 merits wider consideration and use. His experience with 30 patients so treated would seem a wide enough one for the expression of an opinion.

A review of the various methods of treatment of trigeminal neuralgia shows that operative difficulties, recurrence of symptoms and untoward side effects may occur no matter what form of treatment is used. The alcoholic injection of the terminal branches of the nerves or of the lower two divisions at their foramina of exit, the early operation of ganglion extirpation by Frazer the common operation of neurotomy of the root proximal to the ganglion either by the subtemporal route or by the newer and more difficult suboccipital approach, and the latest method, advanced by Sjöqvist in 1938 of performing tractotomy on the descending sensory pathways of the trigeminal nerve within the lower brain stem, are all reviewed briefly by the author.

The accurate coagulation destruction of the gasserian ganglion presupposes the accurate localization of the ganglion before operation. The author has

carefully worked out the anatomical co-ordinates for the passage of the insulated trocar with its central electrode, and the operation, done under general intravenous anesthesia is always performed under roentgenographic control in the department of roentgenology. The instrument is passed through the foramen ovale the ganglion lying at a distance of 19 mm. from the foramen. Repeated coagulation may be necessary to obtain complete relief but while pain is completely abolished, normal sensation may begin to return as early as 3 weeks after coagulation.

Among the author's 301 patients 217 were considered cured. Coagulation was performed twice in 75 patients, 3 times in 85 patients, and 4 times in 12 patients. Postcoagulation paresthesias occurred, apparently in much the same way as they occasionally occur after operative resection of the posterior root. An occasional hemiplegia resulted, as well as some occasional damage to the extraocular muscles, and the keratitis of anesthesia. JOHN MARROT, M.D.

Bajer A.: Contribution to the Problem of Post-operative Anesthesia Dolorosa of the Trigeminal Nerve (*Příspěvek k problému pooperační anesthésie dolorosa trojklaného nervu*). *Lék. listy* 1940, 577.

A middle aged woman, who experienced a severe menopause and was now suffering from high blood pressure (220 mm. Hg) developed a typical neuralgia of the trigeminal nerve at 60 years of age and was operated upon by Kirschner's coagulation of the gasserian ganglion on a different occasion without permanent relief. She was then subjected to a juxtapuncture radiotomy with interruption, through the occipital route of the lower and outer two-thirds of the sensory root of the trigeminal nerve on the left side. There was immediately a loss of sensation over the region supplied by the first and second branches of the trigeminal nerve with lowered sensitivity to touch and lack of the sensations for heat, cold, and pain on that side. The corneal reflex was absent and the patient complained of seeing double and of spasms of the musculature of the left side of the face. The blood pressure dropped to 135/70 mm. Hg.

At re-examination 2 months later there was present a mild enophthalmos and narrowing of the ocular cleft (Horner's syndrome) on the left side, a lowered corneal reflex, hypotonia of the left masticatory muscle group and mild deflection of the tongue to the left side. The left palatal arch was lowered and narrowed there was lowered sensitivity over the left half of the mouth cavity larynx, and anterior two-thirds of the tongue, and a lowered pharyngeal reflex on that side. Over the area supplied by the left trigeminal nerve there has persisted a lowered sensation to touch and nonsensitivity for heat, cold, and pain; however, pressure over this area produced a burning pain which was most pronounced over the left symphysis region and pressure over the sympathetic plexus of the left carotid produced burning pains over the left half of the face which however

persisted for but a short time. At the same time there occurred a marked dilatation of the left pupil. There was also increased sweating over the left half of the face accompanied by an abnormal flushing.

The author recognized these manifestations as an irritative hyperpathia and a sympathalgia, or neuralgia, of the sympathetic nerves and ganglia of the left side of the neck and head, and maintained that they correspond to the *anesthesia dolorosa* as described by Olivecrona, that they are not related to a recurrence of the trigeminal neuralgia, and that they do not require further surgical interference. The irritative hyperpathy could not be influenced by medication but did not trouble the patient very much. The sympathalgia was controlled by giving extractum *fungi secalis* (o i) with luminal (o oz).

JOHN W. BRENNAN, M.D.

SPINAL CORD AND ITS COVERINGS

Begg, A. C., Falconer, M. A., and McGeorge, M.: Myelography in Lumbar Intervertebral Disc Lesions. *Brit. J. Surg.* 1946 34 141.

The authors present results from 86 myelograms done for the investigation of low back pain and sciatica in an attempt to clarify the controversial issues raised in the past regarding the value of this procedure.

Four separate groups of disc lesions are described:

1. Projections
2. Intermittent prolapses: the intervertebral protrusion which occurs only when the vertebrae are subjected to certain strains (also known as the *concealed disc* of Dandy).
3. Extrusions: the condition present following rupture of the annulus fibrosus with escape of the nuclear material into the spinal canal.
4. Scarred discs: over a period of years the opposing surfaces of vertebral bodies may become sclerotic with bony lipping, decrease in the size of the disc space, and subsequent adhesions of the theca and extrathecal nerve roots to the back of the discs without any actual soft tissue projection.

Although their method of examination is essentially the same as that used by other investigators, the authors have employed certain distinct features which need enumeration. The needle is inserted while the patient is horizontal and 3 c.c. of contrast medium (lipiodol or pantopaque) are injected. The patient stands on a vertical tilt table and the table is then tilted downward slowly. Occasionally it may be necessary to turn the patient obliquely to obtain better filling of the root pouches. As the contrast medium straddles each disc space anteroposterior spot films are taken and the tilt angle noted. After the lumbar interspaces have been inspected the tilt is reversed and the medium observed as it flows backward. Prone lateral views of the two lower lumbar interspaces are taken routinely; these have proved of help in diagnosing certain disc lesions. Oblique views rarely reveal information which cannot be ascertained from the lateral and anteroposterior views.

A recent innovation is used in demonstrating the "intermittent prolapse." This consists of having the patient hyperextend the spine by raising his head and shoulders. This maneuver has shown lesions which were not apparent by the usual method of examination. No harmful effects have been observed from either the injection of the contrast medium or allowing the material to remain within the thecal cavity. Although lipiodol was usually aspirated at the time of operation, pantopaque was allowed to remain *in situ*. Follow up roentgenological examinations have shown that this substance is slowly absorbed at a rate of approximately two-thirds of its volume in a year.

The arrangements of the individual nerve roots composing the cauda equina have been found to conform to two general pattern types. In one the nerve roots are separated from each other so that those about to pass from the thecal cavity are lateral while the remainder lie medially. In the other variety the nerve roots lie in two large bundles, one on each side of the midline with a wide free space between. The individual members are arranged so that the cephalic roots are anterior. The anterior wall of the theca is closely applied to the posterior surfaces of the posterior longitudinal ligament except where the lumbosacral angle is more acute than usual (as at the fifth lumbar disc) and a few millimeters of fatty tissue are interposed. This explains why disc lesions at the fourth and higher lumbar spaces affect the myelograms more obviously than prolapses at the fifth lumbar interval.

Myelographic abnormalities usually affect the thecal column or a root pouch so that in the majority of instances the type of lesion as well as the level and size may be (accurately) determined preoperatively. In rare instances the myelogram can be normal with a prolapsed disc. Disc prolapse may be divided into two types according to location: central and lateral. The central prolapses lie anterior to the theca while the lateral ones are between the theca and the intervertebral foramen. Central prolapses present a varying picture which depends on the size of the lesion and the type of cauda equina arrangement present. A constriction or hourglass appearance usually exists in the moderate prolapses when the prolapsed disc is a larger interruption of the contrast medium column results in a gap design. The contrast column with a central area of reduced radiolucency is less common. In the lateral film all of these types are seen as an invagination of the medium by the misplaced disc. In some instances the anteroposterior views may be normal and the lateral film shows the only abnormality. The defect produced by the laterally placed prolapsed disc varies with its position, as when it is medially placed it produces a greater deformity than when it is extremely lateral. In fact it may be so far lateral as to cause no abnormality in the myelogram.

The intermittent disc is best visualized by voluntary hyperextension of the spine during roentgenography and often a normally taken view fails to

7 Primary cholesteatoma of the mastoid due to the presence of embryonal cells in the temporal bone described by Amersbach as epidural cholesteatoma, or mucocele of the mastoid cells. Roentgenologically this is very much similar to the condition in the author's case, but the clinical picture is very different.

8. Benign tumor The author's case might have been a benign tumor but he was unable to explain the alteration of the mastoid as a consequence of such tumor. Surgical intervention revealed a large cavity 3 mm. from the bony cortex, filled with gray tissue and waterlike fluid. This neoplastic mass which was attached to the dura of the middle cranial fossa was removed and histological examination revealed it to be connective tissue. A tumor of this type was named "meningioma" by Cushing. Meningiomas originate from endothelial arachnoid cells enclosed in the dura mater are somewhat prevalent along the sinuses, and communicate with the dura of some of the cranial nerves. The author's case could be classified an endothelioma, as this often occurs in the petrous bone and clinically gives the symptoms and signs of an endocranial tumor.

JOSEPH M. A. PAPP, M.D.

Kubanyi A : The Treatment of Trigeminal Neuralgia by Intracranial Coagulation of the Gasserian Ganglion (Sur le traitement de la névralgie du plexus trigéminal par l'électro-coagulation intracrânienne du ganglion de Gasser) *Lyon chir* 946, 4 68

The author opens with the statement that when comparisons are made of the efficacy of various methods of treatment for any one disease, those treatments longest in use usually show up in a more favorable light than the newer treatments. He believes, however, that the relatively new operation of coagulation of the gasserian ganglion for the treatment of trigeminal neuralgia first propounded by Kirschner in 1931 merits wider consideration and use. His experience with 301 patients so treated would seem a wide enough one for the expression of an opinion.

A review of the various methods of treatment of trigeminal neuralgia shows that operative difficulties, recurrence of symptoms, and untoward side effects may occur no matter what form of treatment is used. The alcoholic injection of the terminal branches of the nerves or of the lower two divisions at their foramina of exit, the early operation of ganglion extirpation by Frazer, the common operation of neurotomy of the root proximal to the ganglion either by the subtemporal route or by the newer and more difficult suboccipital approach, and the latest method, advanced by Sjögqvist in 1938 of performing tractotomy on the descending sensory pathways of the trigeminal nerve within the lower brain stem, are all reviewed briefly by the author.

The accurate coagulation destruction of the gasserian ganglion presupposes the accurate localization of the ganglion before operation. The author has

carefully worked out the anatomical co-ordinates for the passage of the insulated trocar with its central electrode and the operation done under general intravenous anesthesia is always performed under roentgenographic control in the department of roentgenology. The instrument is passed through the foramen ovale the ganglion lying at a distance of 19 mm. from the foramen. Repeated coagulation may be necessary to obtain complete relief but while pain is completely abolished, normal sensation may begin to return as early as 3 weeks after coagulation.

Among the author's 301 patients, 317 were considered cured. Coagulation was performed twice in 75 patients, 3 times in 85 patients, and 4 times in 11 patients. Postcoagulation paresthesias occurred, apparently in much the same way as they occasionally occur after operative resection of the posterior root. An occasional hemiplegia resulted, as well as some occasional damage to the extraocular muscles, and the keratitis of anesthesia. JOHN MARTIN, M.D.

Bajer A.: Contribution to the Problem of Post-operative Anesthesia Dolorosa of the Trigeminal Nerve (Příspěvek k problému pooperační anestezie dolorosa trojklanného nervu) *Čas listy* 946 577

A middle aged woman who experienced a severe menopause and was now suffering from high blood pressure (120 mm. Hg) developed a typical neuralgia of the trigeminal nerve at 60 years of age and was operated upon by Kirschner's coagulation of the gasserian ganglion on a different occasion without permanent relief. She was then subjected to a furta porture radiotomy with interruption, through the occipital route of the lower and outer two-thirds of the sensory root of the trigeminal nerve on the left side. There was immediately a loss of sensation over the region supplied by the first and second branches of the trigeminal nerve, with lowered sensitivity to touch and lack of the sensations for heat, cold, and pain on that side. The corneal reflex was absent and the patient complained of seeing double and of spasms of the musculature of the left side of the face. The blood pressure dropped to 135/70 mm Hg.

At re-examination 2 months later there was present a mild enophthalmos and narrowing of the ocular cleft (Horner's syndrome) on the left side, a lowered corneal reflex, hypotonia of the left masticatory muscle group and mild deflection of the tongue to the left side. The left palatal arch was lowered and narrowed, there was lowered sensitivity over the left half of the mouth cavity, larynx, and anterior two-thirds of the tongue, and a lowered pharyngeal reflex on that side. Over the area supplied by the left trigeminal nerve there has persisted a lowered sensation to touch and nonsensitivity for heat, cold, and pain, however pressure over this area produced a burning pain which was most pronounced over the left zygomatic region, and pressure over the sympathetic plexus of the left carotid produced burning pains over the left half of the face which however

persisted for but a short time. At the same time there occurred a marked dilatation of the left pupil. There was also increased sweating over the left half of the face accompanied by an abnormal flushing.

The author recognized these manifestations as an irritative hyperpathia and a sympathalgia or oculo-gia, of the sympathetic nerves and ganglia of the left side of the neck and head and maintained that they correspond to the *anesthesia dolorosa* as described by Olivecrona, that they are not related to a recurrence of the trigeminal neuralgia and that they do not require further surgical interference. The irritative hyperpathy could not be influenced by medication but did not trouble the patient very much. The sympathalgia was controlled by giving extractum fungi secalis (o r) with luminal (o os).

JOHN W. BREDENMANN M.D.

SPINAL CORD AND ITS COVERINGS

Begg, A. C. Falconer M. A., and McGeorge M.
Myelography in Lumbar Intervertebral Disc Lesions. *Brit J Surg.*, 1946 34 141

The authors present results from 86 myelograms done for the investigation of low back pain and sciatica in an attempt to clarify the controversial issues raised in the past regarding the value of this procedure.

Four separate groups of disc lesions are described:

1. Projections
2. Intermittent prolapses: the intervertebral protrusion which occurs only when the vertebrae are subjected to certain strains (also known as the concealed disc of Dandy)

3. Extrusions: the condition present following rupture of the annulus fibrosus with escape of the nuclear material into the spinal canal

4. Scarred discs: over a period of years the opposing surfaces of vertebral bodies may become sclerotic with bony lipping; decrease in the size of the disc space, and subsequent adhesions of the theca and extrathecal nerve roots to the back of the discs without any actual soft tissue projection.

Although their method of examination is essentially the same as that used by other investigators the authors have employed certain distinct features which need enumeration: the needle is inserted while the patient is horizontal and 3 c.c. of contrast medium (lipiodol or pantopaque) are injected. The patient stands on a vertical tilt table and the table is then tilted downward slowly. Occasionally it may be necessary to turn the patient obliquely to obtain better filling of the root pouches. As the contrast medium straddles each disc space anteroposterior spot films are taken and the tilt angle noted. After the lumbar interspaces have been inspected the tilt is reversed and the medium observed as it flows backward. Prone lateral views of the two lower lumbar interspaces are taken routinely: these have proved of help in diagnosing certain disc lesions. Oblique views rarely reveal information which cannot be ascertained from the lateral and anteroposterior views.

A recent innovation is used in demonstrating the intermittent prolapse. This consists of having the patient hyperextend the spine by raising his head and shoulders. This maneuver has shown lesions which were not apparent by the usual method of examination. No harmful effects have been observed from either the injection of the contrast medium or allowing the material to remain within the thecal cavity. Although lipiodol was usually aspirated at the time of operation, pantopaque was allowed to remain *in situ*. Follow-up roentgenological examinations have shown that this substance is slowly absorbed, at a rate of approximately two-thirds of its volume in a year.

The arrangements of the individual nerve roots composing the cauda equina have been found to conform to two general pattern types. In one, the nerve roots are separated from each other so that those about to pass from the thecal cavity are lateral while the remainder lie medially. In the other variety the nerve roots lie in two large bundles: one on each side of the midline with a wide free space between. The individual members are arranged so that the cephalic roots are anterior. The anterior wall of the theca is closely applied to the posterior surfaces of the posterior longitudinal ligament except where the lumbosacral angle is more acute than usual (as at the fifth lumbar disc) and a few millimeters of fatty tissue are interposed. This explains why disc lesions at the fourth and higher lumbar spaces affect the myelograms more obviously than prolapses at the fifth lumbar interval.

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The intermittent disc is best visualized by voluntary hyperextension of the spine during roentgenography and often a normally taken view fails to

reveal this abnormality. The authors have found that weight bearing does not accentuate this defect as much as the hyperextension.

Extrusions of the disc material may cause obliteration or displacement of the thecal column of contrast medium.

Scarred discs are diagnosed by first noting the narrowed space and bony vertebral spurs in the plain film and, later, the defect in flow of the intrathecal contrast material. Comparison of the contrast defects with plain films show the abnormalities to be at the site of the osteophytic outgrowths and not due to soft tissue projections.

Indirect effects of disc prolapse have been noted in many instances and deserve mention. Swollen letrathecal nerve roots may result from compression by the prolapsed disc and are demonstrated by absence of filling and a band of radiolucency indicating the position of the nerve roots. Leptomeningeal adhesions may occur as a result of long standing disc lesions and produce an obstruction in the thecal column. In the anteroposterior view this has a serrated edge (in contrast to the cauda equina tumor which has a smooth contour) and in the prone lateral film there is noagination of the anterior thecal wall such as with a disc prolapse. Multiple prolapses were present in 17 per cent of the cases.

Artefacts are produced by leakage of the contrast medium outside of the limits of the subarachnoid fluid canal and the following points should be executed:

1. Perform lumbar puncture with the patient in a horizontal position. This is to prevent the additional spinal fluid pressure of an upright position.
2. The injection should not be made within several days of a previous spinal puncture.
3. Injection should be done through a fine needle and the dura and subarachnoid pierced only once.
4. Examination should be made soon after injection, the patient meanwhile remaining horizontal.

The following results were obtained in this series:

1. Of the 76 cases in which the myelogram was considered abnormal, only 2 did not reveal the anticipated lesion. In nearly all these lesions there was a high correlation with regard to the site, type and size of prolapse and the operative findings.

2. In each of the 10 cases in which the myelogram was thought to be normal, a disc lesion was found at operation. In some of these cases the intermittent type of prolapse was found, but the hyperextension maneuver had not been performed during myelography.

The authors conclude that when myelography is positive it is of value in estimating the level and type of prolapse and whether or not single or multiple discs have prolapsed. The information whether or not a prolapse is central or lateral is of value preoperatively since it determines the approach for the surgeon and avoids the unnecessary trauma which exploration would necessitate.

The authors recommend routine investigation of lumbar intervertebral disc lesions by myelography.

but state that it should not displace other clinical methods of diagnosis for disc abnormalities.

C. FREDERICK KITTLE, M.D.

PERIPHERAL NERVES

Courty, A., Cabanettes, L., and Bertrand, L.: Contusions of the Peripheral Nerves Treated by Sympathetic Block (*Contusions nerveuses et infiltrations sympathiques*). *Rev. ch. Par.*, 94, 65-66, 350.

This article concerns 11 cases of so-called contusion of the nerves treated by sympathetic block, all in the upper extremity. Some were probably contusions as the term is understood; others were probably combined vascular and nerve lesions and others could probably be classified as causalgic states. The criteria for a satisfactory sympathetic block, presumably with novocain, are not established. One tellate injection was described as being very satisfactory, and in support of this the statement was made that the hand was very warm; the block was said to last three-quarters of an hour. (Under these circumstances it is difficult to translate this article into terms useful to our concepts.)

Five cases were the result of shoulder dislocation in various positions followed by involvement of the peripheral nerve and in some cases by vasomotor states. A satisfactory stellate injection immediately relieved the vasomotor complex and tended to show the pure peripheral nerve component. In some cases oscilometric readings were found to be diminished as compared with the sound side. In 2 of these cases there was no vasomotor disturbance, and infiltration of the stellate ganglion produced immediate and dramatic improvement in the range of movement of the involved muscles. This improvement was most marked immediately after the injection but tended to fade. There was however a net improvement which was maintained after each injection.

The 6 other patients were injured in various ways. 4 received injuries from missiles in or near the peripheral nerves; in 1 patient the whole arm was pinned under a vehicle and in another a fracture of the humerus injured the nerve. Some of the injuries were mixed nerve and blood vessel lesions; others could not be diagnosed with certainty.

The last case reported was that of a patient who received an injury in January 1945 and was examined the next day. The patient stated that his paralysis followed the operation at which no lesion of the nerve or blood vessel was found. Stimulation of the nerve at operation in March showed complete interruption of conduction. In August a second operation was contemplated but the patient bumped his arm near his old wound. This was immediately followed by such improvement in the movements of the hand that operation was indefinitely postponed.

The authors present tables showing the difference in response to faradic and galvanic stimulation before and after sympathetic block. These show improvement in electrical response which parallels the

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clinical improvement seen in some of the cases. It is believed that the sympathetic block decompresses the nerve. Follow up studies unfortunately were not always available.

ADRIEN VAN BRUGGEN M D

Finocchiaro R.: The Morphological Considerations of Neuroglia in the Isolated Sectioned Nerve. (Sulla morfologia del cosiddetto neurogloma da sezione nei nervi isolati) *Gior ital chir.*, 1946 : 539.

If a paralysis results after section of a nerve, there is some other factor besides the nerve section which causes it. Under normal circumstances following the section of a nerve the perineural tissue reaction favors sclerosis which impairs the function of the injured nerve.

Neurogloma following amputation results in not only a regenerative proliferation of cylinders for maturation but also a proliferation of the cells of Schwann and the fibrous cells of the endoneurium and perineurium. It has been shown that neuro-

fibrils regenerate even after cauterization of the stump or the treatment of the nerve with alcohol.

Two series of experiments were carried out on 8 rabbits in which the sciatic nerve was sectioned. In the first series the sectioned nerve was surrounded by cellophane which isolated the nerve from its blood supply with simple section as a control. The nerves were injected with alcohol in the second series, and the rabbits were killed after 60 days. It was shown that the nerves surrounded with cellophane presented the formation of a fibrous capsule although the ends were free and smooth. In the control animals a sort of detritus formed around the cut ends of the nerve. Alcohol was found to diminish the regenerative action.

The author concludes that isolation of the sectioned nerves from their blood supply does not impair the vitality of the nerve or the normal progress of the process of regeneration and cicatrization but it eliminates the participation of the perineural connective tissue in the reaction following

ARTHUR F. CIPOLLA M D

SURGERY OF THE THORAX

TRACHEA, LUNGS, AND PLEURA

Binet L., and Burstein M.: New Experiments Pertaining to Pulmonary Embolism (Nouvelles recherches sur l'embolie pulmonaire expérimentale). *Press. méd.* 946 54 633

Experiments were carried out on dogs by injecting into the external jugular vein a lycopodium powder suspended in vasoline in oil or a watery suspension of barium sulfate for the purpose of (1) studying the pulmonary circulation during the course of a pulmonary embolism (2) elaborating upon certain neurovegetative reflexes induced by the embolism and finally, (3) studying how the greater circulation adjusts itself under these conditions.

EXPERIMENTS PERTAINING TO THE LESSER CIRCULATION DURING THE COURSE OF AN EMBOLISM

The normal pressure in the pulmonary artery is 2 cm. of Hg or approximately one sixth that of the pressure in the systemic circulation. This pressure is derived from the output of the right ventricle of the heart and from the opposing resistance of the pulmonary vessels to the circulation of the blood.

If small amounts of lycopodium powder or barium sulfate are injected into the external jugular vein with 2 or 3 minute intervals between the injections a progressive rise in the pressure in the pulmonary vessels is immediately noted following the first injection. Various figures are obtained according to the dog. In some animals the pressure may reach 7 cm. of Hg before the right heart collapses, and then the pressure falls to zero. On the other hand a cardiac syncope may occur in the weaker animals when the pressure in the pulmonary artery reaches 5 cm. of Hg. Such a difference is due to the varying effective power of the right ventricle to overcome the peripheral resistance and also to the degree of adjusting reaction which is found to take place in the greater circulation.

What is the cause of such hypertension? Is it the consequence of the mechanical obliteration of the pulmonary vessels alone or of such obliteration combined with spasm?

It is hard to believe that vascular mechanical obstruction alone can produce hypertension.

The circulatory area of the lungs is very extensive and it produces mechanical obstruction in the pulmonary vessels a very large number of emboli particles seem necessary. The hypertension existing in the pulmonary artery occurs early and is very marked, revealing the existence of a very important barrier to the blood flow in the pulmonary vessels. In fact, after ligation of one of the main branches of the pulmonary artery cutting 50 per cent of the blood supply to the lungs, the pressure in the pulmonary artery reaches 3 cm. of Hg at the most. There is a hypertension of from 5 to 7 cm. could then be ex-

plained on the basis of an important vascular spasm brought on by the emboli particles.

The existence of spasm in the vessels of the extremities secondary to an embolus has been ascertained by Leriche's experiments. However the spasm of the pulmonary vessels does not seem to be of a similar nature. This spasm indeed is the direct consequence of a mechanical irritation of the arterioles. However the pulmonary artery itself does not constitute a reflexogenic zone as is the case for the arteries of the extremities. In the former case the reflex originates in the arterioles, while in the latter it originates in the arteries. Furthermore, the peripheral vasoconstriction is secondary to a stimulus of the sympathetic but this is not the case in the lungs. The hypertension in the lesser circulation is independent of the sympathetic, since hypertension in the lesser circulation still exists after bilateral thoracic sympathectomy. Furthermore the authors have shown in a lobe isolated as far as its blood supply is concerned but with an intact nerve supply that novocain infiltration of the stellate ganglion does not produce any vasodilatation of the vessels of the lesser circulation, and the faradization of the same ganglion produces a vasoconstriction not at all similar to the increase in pressure registered during the course of an embolism. Therefore the mechanism of the hypertension seems to be operating through an autonomic reflex independent of the central nervous system.

To summarize, a small embolus in the lungs produces the same circulatory changes and the same obstruction as a large embolus which constitutes a mechanical barrier to the blood flow. If the concept of vascular spasm is accepted. The important factor is not the size of the embolus but the vasoconstriction produced.

Because of the intravascular irritation the functional consequences of a small embolus, by far exceed the mechanical consequences. Large and small emboli can be considered as similar in view of the concept of a spasm.

THE REFLEXES ORIGINATING IN THE LUNGS DURING THE EMBOLISM

A local vasoconstriction is determined by the pulmonary embolus. Can the existence of remote reflexes be proved?

The existence of a reflex bronchospasm through the vagus nerve was already demonstrated in previous experiments. The experiment on the vagal reflexes by producing a small nonfatal embolism following the injection into the external jugular vein of a c.c. of lycopodium powder suspended in vasoline in oil in a 10 to 20 kgm. dog was repeated. Kymographic tracings of the pressure in the carotid as well as if the branch were registered on the vagotomized or atropinized dog the embolism in

jection did not produce any change in the pressure curve nor in the bronchogram. In the animals with an intact vagal innervation and especially in animals which received but only weak doses of eserine (eserine increases the effects of vagal stimulation) the embolizing injection determined a bradycardia and a bronchospasm of varying intensity which disappeared immediately after section of the vagi. Therefore, it seems to be a reflex vagal stimulation due to an innervation of the endovascular nerve endings by the embolizing particles.

The vagal centers during the embolism are stimulated by opposing stimuli there is a marked and precocious venous bradycardia during the embolism and it is known that a tachycardia (Bainbridge reflex) is produced by hypertension in the right auricle because of diminution of the vagal tone. Thus, there are two coexisting vegetative reflexes during the embolism—one originating from the lung and the other originating in the right auricle. This explains why the bradycardia may be absent during the embolism especially if the venous hypertension is found to be marked.

The hypotension in the greater circulation is of cardiac origin and is the immediate result of a diminished cardiac output secondary to venous stasis and insufficient flow of blood into the left auricle. In other words the hypotension is caused by a disturbance in the returning circulation and is absolutely independent of any reflex of pulmonary origin.

STUDY OF THE REACTIONS OF ADAPTATION IN THE GREATER CIRCULATION DURING THE PULMONARY EMBOLISM

It is known during the embolism that the rise in venous pressure is rapid and precocious, which indicates the insufficiency of the right ventricle, which cannot completely empty itself with venous stasis as a direct result. On the other hand the rise in pressure occurs very early in the pulmonary artery and finally the pressure falls in the left auricle secondary to a diminished output of the right ventricle.

The precocious hypertension and the hypotension in the left auricle indicate that in spite of its efforts, the right ventricle is unable to push into the lungs all the blood that it receives hence, venous stasis progressive divergence of the blood from the active circulation, disturbance in the distribution of the blood between the arterial and venous systems decreased output of the left ventricle and finally decreased volume of the circulating blood occur.

A peripheral vasoconstriction is the adaptive reaction of the organism to such a decreased cardiac output.

There exists then during the embolism hypertension in the lesser circulation and hypotension in the greater circulation and a vasoconstriction in both. This vasoconstriction is the cause of the hypertension in the lesser circulation and the consequence of the reduced circulating blood in the greater circulation.

The decrease in the output of the left auricle is related to the inability of the right ventricle to adapt itself to the pulmonary obstacle.

The postembolic circulatory collapse produces a peculiar state of shock, characterized by hypertension in the pulmonary artery venous hypertension and peripheral vasoconstriction which maintains the pressure in spite of a diminished cardiac output.

There are two types of circulatory collapse—one with vasodilatation and one with vasoconstriction. The former occurs during histaminelike shock or follows inhibition of the vasoconstrictor centers or paralysis of the sympathetics. The latter is always secondary to a diminished cardiac output. It may be due to acute cardiac insufficiency or to diminished blood volume secondary to hemorrhage plasma loss (as in traumatic shock, burns) or water loss (as in profuse diarrhea). Pulmonary embolism represents a new example of circulatory collapse with vasoconstriction secondary to a disturbance in the distribution of the blood between the arterial and venous systems.

To summarize experimental pulmonary embolism produces a particular state of shock with hypertension in the lesser circulation hypotension in the greater circulation and vasoconstriction in both. It is related to a disturbance in the distribution of the blood between the arterial and venous systems, secondary to a spasm in the pulmonary vessels.

The embolism produces, besides a bronchospasm a reflex vasoconstriction in the pulmonary vessels independent of the sympathetic innervation and also certain remote reflexes by stimulation of the vagus. There is a peripheral vasoconstriction during the embolism secondary to a diminished cardiac output.

GERARD GAGNON, M.D.

Findlay, C. W. Jr. and Sweet, R. H.: Aerosol Penicillin as a Therapeutic Adjunct in the Preparation of Patients with Suppuration of the Lung for Pulmonary Resection. *J. Thorac. Surg.* 1947 16: 81.

Bronchial secretions in patients with pulmonary suppuration have often been a source of trouble at operation to both the surgeon and the anesthetist. The induction of anesthesia has frequently been difficult. Numerous aspirations of the trachea and bronchi during operation have delayed the surgical procedure, and in some instances death has occurred on the operating table because of the drowning of the patient in his own secretions.

Parenteral and oral chemotherapy have been of considerable value in preparing patients with bronchiectasis or lung abscess for surgery. In spite of this treatment complications during operation due to bronchial secretions have continued. In an attempt to decrease further these bronchopulmonary exudative processes, aerosol penicillin inhalations have been used preoperatively at the Massachusetts General Hospital. The present report was based upon careful studies of the first 20 patients subjected to the treatment.

The authors first describe the technique. They used oxygen to nebulize the drug. In most instances 50,000 units of sodium penicillin dissolved in the nebulizer. Each 8 c.c. of penicillin solution contains 0.25 c.c. of a 50 per cent oil of peppermint solution in isopropyl alcohol. The patient occluded the open side arm of the Y tube only during inspiration. At all other times the oxygen was diverted from the nebulizer via the open arm Y tube. The breath was held for 5 seconds after each inspiration. It usually took 30 minutes for the administration of 1 dose of penicillin. Usually 8 treatments were given each day.

In the series of 20 cases, 14 patients had bronchiectasis. Three patients had lung abscess and there were 3 patients with bronchogenic carcinoma with associated bronchitis, bronchiectasis, or cavitation.

The authors present case studies of all 20 patients and the results. It was found that the odor of bronchial secretions which were foul at the onset was practically eliminated in every instance. There was thinning of the sputum. The sputum production was reduced. The anesthetic course was uncomplicated in 15 of the 20 patients. The postoperative course was much easier.

The authors point out the importance of concomitant therapeutic measures in the preoperative preparation. Postural drainage, bedrest and elevation of the blood proteins and also the intramuscular use of penicillin is important. Sulfadiazine should be used to control the obvious penicillin-resistant organisms in the sputum. The authors stress the individualization of patients for therapy.

PAUL MARSHALL, M.D.

Santy, P., and Bérand, M.: Dangers of Routine Pneumotomy in One Stage for Surgical Treatment of Pulmonary Abscess (Les dangers de la pneumotomie systématique en un temps dans le traitement chirurgical de l'abcès du psoeumon). *Presse med.* 940, 54, 525.

Experience gained from the treatment of 200 patients with pulmonary abscess brings the authors to the following conclusions:

Employment of one operative pneumothorax in the treatment of lung abscess in the absence of sufficient firm and extensive pleural adhesions is fraught with great danger. The authors are vigorously opposed to one stage pneumotomy in the treatment of pulmonary abscesses of recent origin because of the danger of operative pneumothorax and septic inoculation of the pleura. In spite of the immediate application of penicillin and sulfonamides, the prognosis of septic pleurisy is very grave. Two entirely different conditions should be distinguished when one speaks of pulmonary abscess: accidental tear of the pleura in the course of rib resection and incision of the pleura during the course of pneumotomy

after the abscess had been exposed. In the first case the accident is of no great importance because rupture of the pleura and aspiration of the air from the pneumothorax usually prevent complications. In the second instance the adhesions may give way on physical exertion or following a violent attack of cough. In such a case a retraction of the lung toward the mediastinum may follow separation of the adhesions or an exceedingly septic pyopneumothorax may develop in spite of drainage of the pleural cavity and the administration of sulfonamides and gangrene serum.

Two objections to a two stage operation for pulmonary abscess have been advanced: danger of pneumonia and the difficulty encountered in locating the pulmonary cavity deformed by compression. Bronchovascular dissemination may be avoided by limiting the resection to one or two ribs. Of 80 patients who underwent pneumotomies in 1 stage, only 1 patient died after the first stage. He was of advanced age and had abstained from the use of alcohol.

As a rule, pleural symphysis provoked by the incision of locoforn gauze prevents pneumothorax. The danger of such a complication exists only in a patient with an abscess of the middle lobe. In such a case not the parietal but the interlobar pleura may be torn, but such a complication cannot be ascribed to the first stage of the operation. In certain cases evacuation of a lung abscess through the bronchi may take place under the influence of a compression created by the first stage of the operation. A spontaneous cure may thus result. A careful roentgenologic examination never fails to reveal the location of the abscess after the first stage. As to multiple abscesses, a one stage procedure does not facilitate the attempts to localize them.

Only in extremely septic conditions in which delay may be dangerous do the authors advocate one stage procedure.

Their attitude toward chronic abscesses of more than 3 months' duration is less severe because immediate pneumotomy is not fraught with danger.

JOSEPH K. NASSAR, M.D.

Coorsand, A., Himmelsstein, A., Riley, R. L., and Lester, C. W.: A Follow Up Study of the Car diopneumotomy Function in 4 Young Individuals after Pneumectomy. *J. Thorac. Surg.* 1947, 6, 30.

This article reports a basic physiologic study of what has happened to 4 patients who underwent left pneumectomy in childhood or early adolescence now that they have passed their period of active growth.

Three of these cases have been previously reported at an earlier age of the patients, as they were studied at regular intervals since operation. The studies concerned the determination of lung volume, ventilating efficiency of the chest bellows, efficiency of alveolar ventilation and the state of respiratory gas exchanges in the lung and arterial blood at rest and during moderate and exhausting exercise.

One of these patients, who showed no evidence of pulmonary overdistention performed under the tests, in a way quite comparable to normal controls.

Two of the patients, however, who had evidence of pulmonary overdistention under conditions of exhausting exercise showed a reduction in oxygen reserve and a rather marked degree of oxygen unsaturation in the arterial blood.

In 3 of the subjects the blood pressure in the right ventricle was determined by catheterization technique and revealed no hypertension. In 1 instance the pressure within the pulmonary artery was recorded and found to be normal.

The techniques by which the various data were obtained are outlined, and graphic representation of them is frequent.

HIRAM T. LANGSTON, M.D.

Meade, R. H. Jr., Kay, E. B. and Hughes, P. A.: A Report of 196 Lobectomies Performed at Kennedy General Hospital Chest Surgical Center from 1943 to 1946 with 1 Death. *J. Thorac. Surg.*, 1947, 16, 16.

This truly amazing report comprises the lobectomies done between November, 1943 and April, 1946 at one of the Army Chest Surgical Centers, on 190 patients. By the time this paper was read in May, 1946 the series had actually grown to 236 lobectomies with only 1 fatality (approximately 0.5 per cent).

The patients were in a young age group, the largest number being between 20 and 30 years old. Bronchiectasis was the most common disease requiring lobectomy followed in decreasing order by cyst (8 cases). There were 4 bilateral lobectomies. Complications occurred in 27 cases, 15 of them being empyemas (7.5%). Transient jaundice occurred in 7 cases, hemothorax requiring drainage in 1 case and pneumothorax in 2 cases. A focal cerebral lesion was encountered once; it was presumed to be due to an embolus but recovery took place. Atelectasis of a stubborn character occurred once. Four of the empyemas occurred without evidence of bronchial stula.

The preoperative, operative, and postoperative management of these patients is given in some detail, but particular reference being made to the cases of bronchiectasis. Here the preoperative efforts, directed to reducing the quantity of retained sputum as well as the severity of the associated infection, included drainage by posture and intensive infection therapy by intratracheal administration of penicillin. The operations were carried out under the protection of a with controlled respirations was the technique frequently employed. Individual ligation of the drainage of the pleural cavity was routine practice. Water was bronchoscopy at the close of the operation. Interruption of the phrenic nerve was frequently practiced to prevent overdistention of small

amounts of remaining lung tissue for deep seated pain or discomfort and to diminish the pull on incompletely covered bronchial stumps.

HIRAM T. LANGSTON, M.D.

Stephens, H. B., Harroun, P. and Bockert, F. E.: The Use of Curare in Anesthesia for Thoracic Surgery. *J. Thorac. Surg.*, 1947, 16, 50.

This article relates the experience of the authors with 75 patients undergoing major types of thoracic surgical procedures for which curare anesthesia was used. The present purified product of dependable action is marketed under the name of Intocostin.

The use of the cautery in intrathoracic operations can be allowed when a nonexplosive anesthetic agent such as nitrous oxide is used and controlled respiration technique is possible if apnea is produced by the intravenous administration of curare.

The technique evolved is as follows:

The patient is heavily medicated with a short acting barbiturate, morphine and scopolamine. Nitrous oxide and oxygen are given by means of the face mask, pentothal sodium being used if necessary to achieve satisfactory anesthesia. The patient's requirements of nitrous oxide and oxygen are noted as a basis for later maintenance at this time. When a pharyngeal airway has been placed and it is determined that artificial respiration can be maintained by pressure on the breathing bag, a dose of curare (100 mgm. for adults) is given intravenously (30 seconds). When apnea occurs (30 to 60 seconds) manual inflation is started. When maximum relaxation is achieved an orotracheal tube is passed (An additional 100 mgm. of curare are given if necessary). The tracheal tube is connected to the gas machine, a breathing bag and soda lime canister are used and the patient is maintained by the requirements determined during the period of induction. The patient is then properly positioned. A continuous drip of 5 per cent glucose is started so that additional curare can be given with this if necessary.

In children the barbiturate is omitted, but avertin (from 100 to 150 mgm. per kilogram body weight) is given and cyclopropane is used to facilitate the introduction of the tracheal tube. Anesthesia is continued with nitrous oxide and oxygen. Just before the pleura is opened enough curare is given through the intravenous drip of 5 per cent glucose to stop respirations (from 40 to 60 mgm. for a 2 to 4 year old child). Rhythmic inflation is achieved by a T tube in the circuit which can be occluded by the anesthetist's thumb.

Various other details in the management of this technique are clearly pointed out.

There were 8 hospital deaths in this group of 75 patients and the anesthetic may have been partially responsible for 3 of them. The types of surgery for which this technique was used however included numerous very extensive procedures. The maximum length of operation was 10 hours and 40 minutes and 790 mgm. of curare were used.

It is believed that curare has no cumulative effect and possesses no anesthetic properties per se. Prostigmine has not effectively promoted the return of intercostal activity but this activity should be well established before complete control of the patient is relinquished by the anesthetist.

No significant changes in kidney and liver function tests or electrocardiogram tracings have been found in 44, 50 and 35 cases respectively.

HIRSH T. LANGSTON, M.D.

HEART AND PERICARDIUM

Bing, R. J. Vandam, L. D., and Gray, F. D., Jr.: Physiological Studies in Congenital Heart Disease. Procedures. *Bull. Johns H. Univ. Hosp.* 947:80, 7.

Recent studies which led to the surgical treatment of congenital heart disease with cyanosis have stressed the physiological importance of the diminished rate of pulmonary blood flow in the production of anoxemia. Varying types of congenital malformations of the heart with reduced volume of circulation through the lungs have been described. These include cases with pulmonary atresia or stenosis alone or in combination with other malformations to form the tetralogy of Fallot cases with a single ventricle in which the pulmonary artery arises from the rudimentary outlet chamber and cases with truncus arteriosus, in which the circulation of the lungs courses through the bronchial arteries.

The theoretical bases of the calculations made in the course of the physiological studies undertaken are the following:

1. Measurement of the circulation through the pulmonary artery and the systemic circulation. The output of the heart may be calculated with the following:

Cardiac output (ml. per min.) equals

$$\frac{\text{O}_2 \text{ intake (ml. per min.)}}{\text{O}_2 \text{ content of arterial blood (vol. per cent) minus O}_2 \text{ content of mixed venous blood (vol. per cent)}}$$

or

Cardiac output (ml. per min.) equals

$$\frac{\text{CO}_2 \text{ output (ml. per min.)}}{\text{CO}_2 \text{ content of mixed venous blood (vol. per cent) minus CO}_2 \text{ content of arterial blood (vol. per cent)}}$$

The oxygen content of the pulmonary vein (vol. per cent) equals the percentage O₂ saturation of the pulmonary vein times the O₂ capacity (vol. per cent).

The blood flow through the pulmonary artery was subsequently calculated with the equations

Pulmonary artery flow (ml. per min.) equals

$$\frac{\text{O}_2 \text{ intake (ml. per min.)}}{\text{O}_2 \text{ content of pulmonary vein (vol. per cent) minus O}_2 \text{ content of pulmonary artery (vol. per cent)}}$$

or

$$\frac{\text{CO}_2 \text{ output (ml. per min.)}}{\text{CO}_2 \text{ content of pulmonary artery (vol. per cent) minus CO}_2 \text{ content of pulmonary vein (vol. per cent)}}$$

or

$$\frac{\text{CO}_2 \text{ output (ml. per min.)}}{\text{CO}_2 \text{ content of right auricle (vol. per cent) minus CO}_2 \text{ content of pulmonary vein (vol. per cent)}}$$

or

$$\frac{\text{CO}_2 \text{ output (ml. per min.)}}{\text{CO}_2 \text{ content of right auricle (vol. per cent) minus CO}_2 \text{ content of pulmonary vein (vol. per cent)}}$$

2. Measurement of systemic blood flow is obtained with the following formula

Systemic flow equals

$$\frac{\text{O}_2 \text{ consumption (ml. per min.)}}{\text{O}_2 \text{ content of arterial blood (vol. per cent) minus O}_2 \text{ content of right auricular blood (vol. per cent)}}$$

or

$$\frac{\text{CO}_2 \text{ production (ml. per min.)}}{\text{CO}_2 \text{ content of right auricular blood (vol. per cent) minus CO}_2 \text{ content of arterial blood (vol. per cent)}}$$

3. The total volume of blood perfusing the lung (pulmonary capillary flow) is determined with the use of the following formula

Pulmonary capillary flow (total pulmonary blood flow) ml. per min. equals

$$\frac{\text{CO}_2 \text{ output (ml. per min.)}}{\text{CO}_2 \text{ content of blood reaching alveoli (vol. per cent) minus CO}_2 \text{ content of pulmonary vein blood (vol. per cent)}}$$

4. In determining the shunts the pulmonary capillary flow is taken to represent the amount of blood reaching the lung through the pulmonary artery and through the collateral vessels. Consequently the measurement of the total pulmonary artery and capillary flows permits the determination of the volume flow through the collateral circulation to the lung by the following formula

Collateral circulation to the lungs (ml. per min.) equals pulmonary capillary flow (ml. per min.) minus pulmonary artery flow (ml. per min.)

In cases of the tetralogy of Fallot the systemic flow exceeded that through the pulmonary artery the difference between the two volume flows representing the shunt from the right ventricle through the interventricular septal defect or the overriding aorta. Therefore it was possible to calculate the intracardiac shunt from right to left by the following formula

Intracardiac shunt right to left (ml. per min.) equals volume of blood flow through the systemic circulation (ml. per min.) minus volume of blood flow through pulmonary artery (ml. per min.)

5. Calculation of the mixed venous pulmonary flow. The mixed venous pulmonary flow may be defined as the volume of blood which, after its return to the right auricle, ultimately reaches the pulmonary alveoli. Since it is the only component of the circulating blood which becomes effectively oxygenated in the alveolar space, it is referred to as the effective pulmonary blood flow

Effective pulmonary blood flow (ml. per min.) equals

$$\frac{\text{O}_2 \text{ consumption (ml. per min.)}}{\text{O}_2 \text{ content of pulmonary vein blood (vol. per cent) minus O}_2 \text{ content of right auricle blood (vol. per cent)}}$$

or

$$\frac{\text{CO}_2 \text{ output (ml. per min.)}}{\text{CO}_2 \text{ content of right auricle (vol. per cent) minus CO}_2 \text{ content of pulmonary vein (vol. per cent)}}$$

or

$$\frac{\text{CO}_2 \text{ output (ml. per min.)}}{\text{CO}_2 \text{ content of right auricle (vol. per cent) minus CO}_2 \text{ content of pulmonary vein (vol. per cent)}}$$

or

$$\frac{\text{CO}_2 \text{ output (ml. per min.)}}{\text{CO}_2 \text{ content of right auricle (vol. per cent) minus CO}_2 \text{ content of pulmonary vein (vol. per cent)}}$$

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$$\frac{\text{CO}_2 \text{ output (ml. per min.)}}{\text{CO}_2 \text{ content of right auricle (vol. per cent) minus CO}_2 \text{ content of pulmonary vein (vol. per cent)}}$$

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or

$$\frac{\text{CO}_2 \text{ output (ml. per min.)}}{\text{CO}_2 \text{ content of right auricle (vol. per cent) minus CO}_2 \text{ content of pulmonary vein (vol. per cent)}}$$

or

$$\frac{\text{CO}_2 \text{ output (ml. per min.)}}{\text{CO}_2 \text{ content of right auricle (vol. per cent) minus CO}_2 \text{ content of pulmonary vein (vol. per cent)}}$$

or

$$\frac{\text{CO}_2 \text{ output (ml. per min.)}}{\text{CO}_2 \text{ content of right auricle (vol. per cent) minus CO}_2 \text{ content of pulmonary vein (vol. per cent)}}$$

Percentage of total mixed blood reaching lung equals

$$\frac{\text{Effective pulmonary blood flow}}{\text{systemic blood flow}} \times 100$$

The resistance in the systemic circulation was calculated by the formula of Aperia
Peripheral resistance equals

$$\frac{\text{Mean systemic blood pressure}}{\text{flow in systemic circulation per second}} \times 1332$$

On the basis of these formulas and the technical procedures described reports will be published dealing with the preoperative and postoperative findings in patients with a reduced pulmonary blood flow, and with investigations in individuals with increased circulation through the lungs. SAMUEL KARLO MD

Decker P : Avenues of Approach in Pericardectomy (Les voies d'accès à la péricardectomie) *Press méd* 1947 55 59.

At the present time there are two means of access to the pericardium in general use for the treatment of adhesive fibrous pericarditis. These are the extra pleural, or interpleural, anterior approach with resection of the ribs and costal cartilages 3 through 6 and the left transpleural approach through the sixth intercostal space without the resection of any ribs.

Up to the present time most pericardial operations have been carried out through the anterior opening, but the author is of the opinion that the lateral, transpleural approach offers many advantages and more actual safety than the more common type of operation. He points out that the purpose of pericardectomy is not to uncover all of the heart, but rather to uncap it, as one would uncap any rigid box. The safest and most effective place for such an uncapping process is generally accepted to be the left ventricle. Uncapping the right ventricle might result in sudden and fatal dilatation of that chamber of the heart. The fragile auricles must be avoided because they are so easily damaged. Even the inter-ventricular septum must not be molested so as not to interfere with the support of the tricuspid valve.

The author recognizes that the anterior approach through the mediastinum allows the use of local anesthesia, and that, also, such an approach may be necessary when the pleural space is frozen and obliterated. However he prefers to do a pericardectomy under general anesthesia in any type of operation. The anterior approach leads to the right, not the left ventricle and therefore it may actually be inconvenient. Furthermore the patient is left with a permanent skeletal defect, and the bounding heart easily seen under the soft chest wall, may be a source of concern to the patient. By means of the transpleural lateral approach, pleural lysis can be accomplished if that is necessary, the left ventricle is easily accessible, the phrenic nerve can be easily visualized and protected, and by such an approach a greater total number of various lesions are more easily managed than when they are attacked through the mediastinum.

JOHN MARTIN MD

ESOPHAGUS AND MEDIASTINUM

De Vernejoul and Metras II : Esophagectomy for Cancer of the Thoracic Esophagus. Intra-thoracic Gastroesophageal Anastomosis. Three Observations. (Esophagectomie pour cancer de l'oesophage thoracique. Anastomose gastro-oesophagienne intrathoracique. Trois observations)

De Vernejoul and Metras II : Juxta-cardial Ulcer Gastrectomy by the Left Transthoracic Route. Two Observations (Ulceres juxta-cardiales. Gastrectomie par voie thoracique gauche. Deux observations)

Ballivet : Left Transthoracic Esophagogastricectomy for Cancer Placed High on the Lesser Curvature. Extending to the Cardia (Esophagogastricomie par voie thoracique gauche pour cancer haut situé de la petite courbure propagée au cardia) *Mém Acad chir. Par.*, 1946 72 513

All of the 6 operations reported consisted in extensive resection of the esophagus and stomach by the left transthoracic route with immediate esophagogastric suture done by the technique common in America and Scandinavia. There was only 1 death, which was sudden without pain and characterized by dyspnea and collapse. A partial autopsy which did not include the heart and blood vessels, did not reveal the cause.

d Allaines added 2 cases with sudden death following this operation, from his own personal experience. No autopsy report of either was given. One patient died immediately after the operation (he sat up suddenly while being transported from the operating table to bed and died in syncope) and the other died the next morning with sudden pain in right chest and collapse resembling that of a massive pulmonary embolism.

Five of the 6 patients recovered from the operation and today have put on weight and are without evidence of recurrence. One of these patients drank some milk against instructions and developed a fistula which necessitated a jejunostomy. This case demonstrated the occasional value of jejunostomy or gastrostomy in these patients. However these procedures are not approved of generally especially when they are done preoperatively as the distortion and fixation of parts with the subsequent adhesions make the subsequent transthoracic stage of the operation more difficult. This objection applies also to the combined operation with preliminary laparotomy for mobilizing the stomach and to the transthoracic approach on the right side where of course a preliminary laparotomy with mobilization of the stomach is necessary. The transferring of the esophageal stump across the aorta to the left side in high resections of this organ is also condemned as well as the argument that the right transthoracic resection is of advantage because injury to the left pleura is less frequent than injury to the right pleura when the approach is made from the left side. It is pointed out in this connection that pleural injury in this operation is of no consequence.

On the whole d Allaines thinks that this series of 6 cases of left sided transthoracic resection with 5

SURGERY OF THE ABDOMEN

GASTROINTESTINAL TRACT

Lanzetta, A.: Peroral Division and Extramucosal Cardiomycotomy in the Cure of So-Called Cardiospasm. (La divisione perorale la cardiomiotomia extramucosa nella cura del così detto cardiospasma) *Palchikoe sez. hlr* 946 53 235

In the period from 1931 to 1942 11 cases of cardiospasm were treated by conservative means with the Plummer sound, and favorable results were obtained in all. Following an aerial bombardment the sound was destroyed and then Voldroni resorted to extra mucosal cardiomycotomy or Heller's operation for the treatment of 11 cases, 1 being a recurrence of 1 of the cases treated conservatively.

The operation was performed through a median supraumbilical incision. The anterior wall of the cardia was incised down to the mucosa, the incision extending from the dilated esophagus to the anterior wall of the stomach for a distance of 1 or 2 cm. The length of the incision varied from 6 to 12 cm. The incision was then closed transversely in layers. In 4 cases the left vagus was also sectioned. The results obtained were very good in all of the cases, even in those in which the patients were not able to swallow liquids or solids.

In comparing the 2 methods, the author recommends that because of its simplicity the conservative method of using Plummer's sound should first be tried. Heller's operation should be reserved for cases not responding to conservative measures. Should this operation also prove unsuccessful, an esophagogastrostomy could be done. However the author believes that this would rarely have to be resorted to, if the previous procedures were carried out properly.

LEONARD J. PROCTOR, M.D.

Bergeret and Ollivier: Inflammatory Tumors of the Stomach (Les tumeurs inflammatoires de l'estomac) *Rev. ch. Par* 1946, 65 297

The authors prefer the term "granuloma" or "chronic phlegmon of the stomach" to "inflammatory tumors" which is the popular designation for these lesions in France. The discussion is limited to primary inflammatory tumors and to those following ulcer. The authors collected 48 cases, 1 the former type and a few cases of the latter type. In many cases inflammatory tumors have been taken for carcinomas and the patients have been subjected to extensive operations whereas these tumors have a tendency toward spontaneous regression. Also tumors developing after ulcer will frequently respond to prolonged medical treatment. Furthermore once the surgeon is aware of the benign nature of the lesion, gastrectomy can be less radical.

A brief review of cases of inflammatory tumor simulating cancer reported in the literature is presented, beginning with Terrier's case in 1904.

Inflammatory tumors of the stomach occur twice as frequently in males as in females and 5 percent occur in patients between the ages of 30 and 60 years. In more than one-third of the cases there is a history of gastric disturbances in the form of postprandial pain for a period of years. These symptoms are not much more severe in the cases of tumor following ulcer. In 2 cases the first disturbances appeared shortly after epigastric injury and after a fall causing a bruised back respectively.

In its primary form, inflammatory tumor is nearly always a complication of chronic gastritis with characteristic interstitial, atrophic, or hypertrophic lesions. Frequently there is no roentgenologic evidence of ulcer in such cases. Lesions may vary from a simple reddening of the mucosa in atrophic gastritis with or without posterior perigastritis to induration or the formation of an antral mass adherent to the liver and pancreas resembling a neoplasm even at operation. It is possible that microbic invasion is favored by these tiny superficial erosions. The origin of the gastritis is obscure, and the authors can throw little light on this aspect except to emphasize the infrequency with which alcoholism seems to play a part as contrasted with the apparently important significance of this factor in phlegmon of the stomach. The possible significance of an acute intermediary phase between these chronic affections and the development of the inflammatory tumor has been suggested. However the authors believe that such a development is likely only in a small number of cases, since initial febrile interludes have been reported in less than one-fifth of the patients. In some instances a hematogenous or lymphatic route of infection has seemed probable. The gastric wall has no special immunity to pathogenic organisms. One rarely have foreign bodies or food particles been regarded as related to the inflammatory process. Bacteriologic studies were made in only 4 cases, revealing hemolytic streptococci in 2 cases and hemolytic staphylococci and gram positive cocci in 2 other cases respectively.

The primary tumors may appear subacute, chronic, stenosing and extraorbital. In the subacute forms attention to the patient's history and the symptoms and course of the affection, rather than the laparotomy findings, should help to avoid dangerous and futile extirpations. Diagnostic features of the chronic stenosing and chronic non stenosing forms are described as well as types developing from ulcer. Localized hypertrophy of the gastric mucosa simulating neoplasm is not included in this study, only diffuse infiltrations of the other layers of the gastric wall, with or without ulcer. It is better to base the diagnosis on clinical and roentgenologic findings than on laparotomy findings. There is a history of pain and vomiting as described, and emaciation in one half of the cases. Fever is rarely

encountered but hemorrhage from the mouth or anus occurs in about 1 of every 5 cases. There may be slight jaundice. In less than one-half of the cases, abdominal palpation will reveal abnormal resistance or tumor especially in the epigastric region and much less frequently in the right or left periumbilical region. The size of the tumor may vary from that of an egg to that of an adult head. Fixation depends upon the dimensions of the tumor. The course is fairly rapid, and more than two-thirds of the patients come to operation within 6 months or less after onset. Acute exacerbations are rare. None of the characteristic roentgenologic features such as diverticula, absence of global retraction of the stomach, or mucosal integrity would suffice per se to exclude cancer but the presence of several signs together with some others not seen in cancer may serve to identify the lesion. Gastroscopy is a valuable aid especially in the differentiation of cancer from neoplasm. Cutler recommended preoperative biopsy but this is not a reliable aid. Nor can glandular biopsy be said to be decisive. Perhaps a gastrotomy made at the point where one would expect to perform gastroenterostomy in the event of positive findings would prove the best method for establishing the integrity of the mucosa. However exploratory laparotomy has not proved of value to date.

In the differential diagnosis one has to consider cancer syphilis and tuberculosis. For inflammatory tumors about an ulcer treatment resolves itself into ulcer therapy. Medical treatment has yielded good results in some cases. It should at least diminish periculous inflammation, thus rendering surgery less difficult and dangerous. Once the benign nature of the lesion is ascertained as little tissue as possible should be removed. In primary tumors of inflammatory nature a few months of medical treatment will result in cure. Because of confusion with cancer nearly all of the afflicted patients are subjected to gastrectomy. The mortality rate is 50 per cent, whereas in gastroenterostomy the mortality rate was 0. Gastroenterostomy is however indicated only in the presence of a mass causing serious obstruction and which cannot be extirpated.

EDITH SCHIARCHÉ MOORE, M.D.

Bradley W F Small, J T., Wilson J W and Walters, W: Gastric Neurectomy. *J Am Med Ass* 1947 133 459.

Anatomic consideration of the nervous structures from the cardiopulmonary plexus to the stomach has revealed great variation in pattern whereas the nerves are remarkably constant in course and distribution after reaching the stomach. In dissection in more than 100 cases at autopsy the authors concentrated, therefore, on the region above the stomach in order to evaluate the thoracic and abdominal approaches to the lower part of the esophagus for vagotomy.

In 92 of the authors' cases the gastric nerves took origin from the esophageal plexus. As the gastric nerves coursed caudad many intercommunicating

branches were observed between the right and left trunks. Small fibers, which coursed anteriorly and inferiorly over the vertebral column and the aorta were added to the gastric nerves. Communicating branches were sometimes seen to enter the musculature of the esophagus and either lose their identity or re-emerge onto the surface of the esophagus at some more caudad position. By the time the nerve trunks and branches had reached the esophageal hiatus two relatively large trunks were formed. These trunks passed through the esophageal hiatus below which their course was remarkably constant.

The 92 cases constitute 3 of the authors' groups. In the first group all of the branches between the gastric nerves and from more remote regions joined in common trunks, one on the right and one on the left side of the esophagus somewhere between the esophageal hiatus and 6 cm above the diaphragm. There were 64 such cases.

In the second group there were so many intercommunicating branches between the main trunks of the gastric nerves that a plexus was formed over a major portion of the surface of the esophagus. The branches ultimately united and formed two main trunks at the esophageal hiatus. There were 7 such cases.

The third group was characterized by the long discrete trunks without any additions to their fibers or communicating branches for a distance of 6 cm above the diaphragm. There were 21 such cases.

The fourth group was made up of the remaining 8 cases. The nerves did not have a consistent or uniform course or pattern. In cases of this type it might become difficult for the surgeon to section all the gastric nerves.

As the trunks passed through the esophageal hiatus the relative position of the right and left trunks about the esophagus was noted.

Below the esophageal hiatus the course was remarkably constant. The right gastric nerve the larger in 54 cases coursed posteriorly and to the left. After about 3 to 5 cm, this right gastric nerve divided into numerous branches. One of these branches followed the lesser curvature of the stomach as far as the incisura and another large branch followed the left gastric artery. The routine dissections did not carry beyond the division of the right gastric nerve into these branches.

The left nerve, on the other hand had a short course in the abdomen. As the left gastric nerve came to lie on the anterior surface of the stomach it almost immediately divided into numerous small branches which lost their identity in the serosa and musculature of the stomach. A branch known as the anterior nerve of the lesser curvature was consistently present behind the anterior leaf of the gastrophrenic omentum. Occasionally a small communicating branch between the right and left gastric nerves could be identified at the esophageal hiatus.

This work suggests that in slightly more than 90 per cent of cases a transabdominal subdiaphragmatic surgical approach will allow as nearly complete a division of all of the gastric nerves as a transthoracic

which had been present for years previously. In some cases in which the patient died later from other causes the autopsy examination revealed fibrous cicatrization of the giant ulcers.

The author believes that the treatment is also indicated to establish the differential diagnosis between carcinoma and ulcer. Since carcinoma makes very slow progress in elderly patients the delay of a few weeks is preferable to the risk of an operation. Even in cases of carcinoma the drug is of beneficial influence as it cures the peritumoral inflammation and superimposed secondary infection which facilitates the gastrectomy. In all so-called surgical ulcers of the vertical portion in elderly patients this treatment should be applied as a last resort before operation is attempted.

No explanation is given for the miraculous success obtained with this new compound.

WERNER M. SCHWITZ, M.D.

Bloech P. Severe Hemorrhages from Gastro-duodenal Ulcer (Le grandi emorragie da ulcera gastro-duodenale). *Polidictica sez. chir.* 1946 53 244.

Blood studies were made on 48 patients with gastric hemorrhage. The authors concluded that for the first 3 or 4 days there is a gradual rise in the azotemia which then gradually begins to return to normal. There is a parallel rise in polypeptidemia, aminoacidemia, and xanthoproteinemias.

The blood chlorides tend to diminish notably in grave cases.

Of the 48 cases studied 3 terminated fatally. All 3 had an abnormal rise in azotemia and death occurred between the ninth and twelfth days. None of these presented an anemic picture or evidence of recent hemorrhage. The azotemia is considered to be of great prognostic significance. The azotemia curve rose to 70 mgm. per cent as an average for all cases. In the 3 cases in which death occurred this figure rose to 615, 500 and 337 respectively.

LECCIA J. FRONZONI, M.D.

Gambigliani Zoccolotti A. and Zambelli E.: Treatment of Gastroduodenal Ulcer with Novocain Given by Mouth (Sulla terapia dell'ulcera gastro-duodenale con novocaina per os). *Minerva med. Tor.*, 1946, 37 493.

Reference is made to the original work of Hamori and Szenes (1943) in the Russian clinic at Budapest on the anesthetic treatment of peptic ulcer when these men substituted novocain for larcocaine as originally used by Bayer.

The method of treatment was as follows:

The novocain was dispensed in 1 gm. powders which the patient was instructed to dissolve in 100 c.c. of water (1% solution). This was taken in about 20 minutes by mouth on an empty stomach. Taking the drug slowly avoids the burning sensation and too rapid emptying from the stomach. The patient lay in a supine position for 30 minutes after which he was allowed to have breakfast. No special diet was

prescribed and no other medication used except an occasional antacid. This was not allowed for several hours after the novocain was taken in order to avoid precipitation of the drug.

The cases treated were 20 in all: 13 gastric ulcers on the lesser curvature, 2 pyloric ulcers and 5 duodenal ulcers. Of the patients with gastric ulcers 2 showed tarry stools of moderate degree. Those with pyloric ulcers showed retention at 12 and 24 hours respectively.

Seventeen cases, or 85 per cent, were improved: 12 gastric, 1 pyloric and 4 duodenal.

The duration of the treatment was from a minimum of 20 days to a maximum of 60 days. No disturbance was noted from the use of the drug.

The beneficial results are explained as being due to the anesthetic action on the ulcer itself which causes a diminution of pain and also of acid secretion of the stomach. Bayer was quoted as stating that the beneficial results are due to the fact that the ulcer area is rendered insensible, as first shown by Spiesse who demonstrated that areas of inflammation heal more readily when locally anesthetized. These results are similar to the beneficial results of the local use of novocain in the treatment of trophic ulcers. Reference is made to good results obtained by dorsal and lumbar sympathetic ganglion blocks, as reported by Mezo and Daskowsky. Froehlich is quoted as reporting 14 cures among 25 cases lasting over 4 years after removal of the first lumbar ganglion on one side. The paper is summarized as follows:

1. The daily administration by mouth of a watery solution of novocain is considered efficacious treatment of peptic ulcer. It is based on a neurocirculatory mechanism.

2. Recent ulcers of the lesser curvature are more easily healed.

3. Ulcers with pyloric stenosis and retention do not respond to this treatment. If however the retention is due to functional spasm results are good.

4. The novocain treatment of ulcers is not intended to take the place of other methods but no peptic ulcer should be considered medically incurable until this valid method is tried.

LUCIAN J. FRONZONI, M.D.

Wangensteen, O. H.: The Role of the Surgeon in the Management of Peptic Ulcer. *England J. Med.*, 1947 236 191.

Wangensteen has estimated that about 10,000 people die yearly in this country from ulcer and its complications. Autopsy records show an ulcer or ulcer scar in from 2 to 5 per cent of the cases.

It has been shown that gastric mucosal erosions occur readily and that in the exteriorized gastric or intestinal mucosal pouch the progress from a mucosal erosion to a fully developed ulcer can take place in the course of a few hours under the influence of dripping gastric juice.

The well known Mann-Williamson experimental procedure for producing ulcer in the dog, although highly unphysiologic in many respects focussed

A successful operation should not compromise the future of the patient and should carry a risk of life that is less than that of the disease. Patients with gastric ulcer are more readily cured of the ulcer diathesis by resection than patients with duodenal ulcer. Women are more amenable to cure by operation than men.

Wangensteen reiterates that on the basis of experimental studies an operation for combating the ulcer diathesis in man consists of an extensive gastric resection (75 per cent) the employment of a short afferent duodenojejunal loop and a retrocolic anastomosis at the suspensory duodenojejunal ligament, and the excision of the antral mucosa. Failure on the part of the surgeon to observe all these elements of a satisfactory resection may invite a stomal ulcer.

ROBERT TURNER, M.D.

Aguirre, C. Postgastrectomy Peptic Ulcer following Billroth I Operation (Ulcers peptica post gastrectomia en el Billroth No 1) *Arch. argent. enferm. ap. digest.* 1946 31 355

The author has observed the incidence of 4 peptic ulcers among 133 cases treated by gastrectomy according to the Billroth No. 1 method. The recurrences started from 8 months to 4 years after the gastrectomy and the 4 patients showed a marked hyperchlorhydria.

The clinicorontogenological examination has made possible the exact diagnosis, and has confirmed the evolution of the process up to distalization following medical management.

Others have found that an achlorhydria resulted in practically all cases of gastric ulcers but in only 25 per cent of cases of duodenal ulcers in which a Billroth No. 1 operation was done. In the author's own series 50 per cent of the patients with gastric ulcer subjected to the Billroth No. 1 operation presented achlorhydria later.

As a prophylaxis against postoperative recurrence of ulcers one must resect the pylorus and have an ample anastomotic opening. Vagotomy is of benefit not only as a prophylaxis against recurrence but also as a treatment for cases which do not respond to medical management.

ARTHUR F. CIPOLLA, M.D.

Eliaeson E. L. and Welty R. F.: A Ten Year Survey of Intestinal Obstruction. *Ann. Surg.* 1947 125 57

A statistical review of 202 cases of intestinal obstruction is presented.

The average age of those who survived was 44 years and of those who died 59 years.

The mortality did not seem to be influenced by whether or not the obstruction was complete or partial, acute or chronic. Improvement in operative technique and in pre and postoperative care probably accounts for this.

The mortality rate in cases of small bowel obstruction was shown to be one half that for cases of large bowel obstruction.

Thirty four per cent of the patients with obstruction due to malignancy and 31 per cent of those with obstruction due to femoral hernia died. This is in contrast to a mortality of 5 per cent in the cases of obstruction which were due to inguinal hernia.

The mortality in the group showing strangulation was only 13 per cent.

If resection was necessary the mortality rate was almost doubled.

The overall mortality in this series was 11 per cent. If the cases of malignancy and strangulation are excluded the mortality in the remaining 159 cases is 1 per cent.

Following the introduction of the Miller Abbott tube the mortality in this series was reduced by one half. Other factors including transfusion chemotherapy and improvement in anesthesia unquestionably contributed to the decrease in mortality.

JOHN J. MALONEY, M.D.

Oberhelman H. A. and Condon, J. B. Acute Intussusception in Infants and Children; An Analysis of 95 Cases in the Cook County Children's Hospital. *Surg. Clin. A. America* 1947 27 3

The authors present an analysis of 95 cases of acute intussusception in infants and children admitted to the Cook County Children's Hospital, Chicago during the 21 year period from 1925 to 1945 inclusive.

The age incidence was as follows: 68.6 per cent of the patients were under 1 year (of which 60.6 per cent were under 9 months and 36.3 per cent under 6 months); 20.3 per cent were between 1 and 3 years; 9 per cent between 2 and 3 years and 3 per cent were 3 years old or over. The youngest was 2 weeks old and the oldest 15 years. There were 65 males and 30 females. Forty-six patients were white and 45 negro in 4 cases the race was not mentioned. There was no marked seasonal variation. Changes in diet were noted in the histories only occasionally and there was little difference in the incidence of intussusception in the breast fed and the artificially fed babies. One patient swallowed 1/2 ounce of turpentine on the day before the onset.

The following pathologic conditions were found at operation and considered as demonstrable etiologic factors in 16 patients: Meckel's diverticulum in 6, enlarged mesenteric lymph nodes in 3, congenital malformation of the mesocolon in 2, intestinal polyps in 2 (1 in the ileum and 1 in the sigmoid colon), an adhesive band passing over the front of the terminal ileum in 1, a nodule of aberrant pancreatic tissue in the ileum in 1 and a recently invaginated appendical stump in 1.

The onset of symptoms was acute, usually characterized by vomiting and abdominal pain. Vomiting was most frequent occurring in 89 patients. Abdominal pain present in 84 patients usually preceded the vomiting and was cramplike and intermittent in character.

Bloody stools, usually of the currant jelly type were noted in 82 patients. In most instances the

blood did not appear before 12 to 16 hours after the onset of pain.

Abdominal masses were noted in 77 patients, the most frequent sites being the right upper quadrant and the left lower quadrant. The masses were oval, movable as a rule, and moderately tender. Rectal examination was made in 63 patients and, in 13 masses were palpable.

Signs of intestinal obstruction were noted in 40 patients, and in the first 24 hours in 19 of these. Shock was present in 34 patients; in 11 it was an early symptom initiated by the sudden onset of severe pain and vomiting, and in 13 it was associated with signs of intestinal obstruction.

The diagnosis of acute intussusception was correctly made in all but 1 patient. The symptom triad of abdominal pain, vomiting, and bloody stools was present in 67; these patients also had palpable abdominal masses. Roentgen examination, by means of either a scout film or a barium enema, was made in 35 patients.

Operation is advised for cases of acute intussusception because of the uncertainty of complete reduction and the danger of causing overdistention and rupture of an already damaged bowel by hydrostatic pressure. The grouping of patients into nonoperative and operative groups does not mean that the reduction of the intussusception in the nonoperative group was so planned.

In the nonsurgically treated group there were 10 patients, representing 11 cases (1 recurrence). In 6 patients the intussusception was reduced by means of the barium enema which was used as a diagnostic aid. The reduction was spontaneous in 1 case. There were 3 deaths (37.5 per cent mortality), 2 of the patients who died were moribund on admission, and an error in diagnosis was made in the third fatal case.

In the surgically treated group there were 85 patients, representing 88 operations and 16 deaths (18.8 per cent mortality).

Adequate preoperative care is essential. This is represented by the administration of fluids parenterally to overcome dehydration, supplemented by plasma or blood in critically ill patients, and continuous Wangenstein suction through a Levin tube to keep the stomach and upper intestine decompressed. For preoperative medication infants under 1 year received atropine (1/500 gr.) without morphine, and children over 1 year were given atropine (1/550 gr.) and rarely morphine.

Ether is the anesthetic of choice and was used by the open drop method in 70 of the 88 operations.

Intussusception is a migratory lesion, but regardless of its migration it usually takes its origin in the ileocecal region. The operative incision should, therefore, be made in the right lower quadrant of the abdomen. A relatively long right rectus incision permits exploration of the other quadrants.

The types of intussusception were as follows: ileocecal or ileocolic in 64 patients; ileosigmocecal or colic in 8; ileocolic in 4; colocolic in 4, and appendicocolic in 1. The type was not mentioned in 4 patients

and in 3 cases the intussusception was found to be reduced.

The operative procedure was manual reduction in 68 patients, aided in a few instances by hydrostatic or aerostatic pressure. Appendectomy was performed in 7 cases because of acute hyperemia. (The authors do not recommend routine appendectomy.) In 1 patient a polyp of the sigmoid was the apex of a sigmoidorectal intussusception, which had presented itself at the anus. Through an anal speculum the polyp was excised and the intussusception reduced by manual manipulation.

Intestinal resections were performed in 13 patients because the intussusception was either irreducible or the bowel wall was necrotic after reduction. The types of resection were as follows: Lahey-Miles exteriorization in 6 (recommended for resections of the cecum and terminal ileum); resection of the ileum and end-to-end anastomosis in 5; primary resection of the cecum and ileum in 1; and Meckel's diverticulectomy in 1. In 1 patient an anastomosis was made around the irreducible mass.

Adequate postoperative care is highly important. The measures discussed in the preoperative care are continued. Plasma and blood transfusions are especially indicated on the day of operation and again on the third or fourth postoperative day. Postoperative distention must be controlled by continuous suction until evidence of bowel function has returned. At this time fluids and foods may safely be administered orally. Penicillin, the sulfonamides and vitamins are used routinely.

There were 4 recurrences in 3 patients, 3 after barium enemas and 1 after operation. In 1 patient in whom an appendectomy was performed after manual reduction the invaginated appendical stump was found to be the apex of the intussusception. A Meckel's diverticulum was the cause in 1 patient.

Postoperative complications occurred in 9 patients and were as follows: evisceration in 3; bronchopneumonia in 3; wound infections in 2; and intestinal obstruction in 1 patient; all of the patients recovered.

The mortality rate among the 95 patients was 19.1 per cent. Of the 9 patients who died, 2 were moribund on admission and no surgery was considered. The operative deaths occurred during operation in 1 patient, within 30 hours postoperatively from shock in 11 and in less than 5 days from toxemia and generalized peritonitis in 4.

The duration of symptoms is the greatest single factor responsible for the high mortality. The mortality rate rose from a 3 per cent for the first day to 15.7 per cent for the second day and to 40 per cent for the third day.

Signs of intestinal obstruction offered an unfavorable prognosis. Thirteen, or 63 per cent, of the 19 patients who died had visible signs of obstruction. The relation of shock and mortality varied with the duration of the symptoms: 1 death occurred among 17 cases in under 48 hours (5.9 per cent mortality), while 9 deaths occurred among 17 cases in over 48 hours (53 per cent mortality).

Deaths in relation to the types of intussusception were as follows: 12 deaths in 64 cases of ileocecal or ileocolic intussusception (18.7 per cent mortality); 1 death in 8 cases of ileoileocecal or colic intussusception (12.5 per cent mortality); and none in 4 cases of ileoileal and 4 cases of colocolic intussusception.

The distance to which the intussusception had advanced was not determined necessarily by the duration of the symptoms and the mortality bore no constant relationship to the distances to which the intussusception had progressed.

Meckel's diverticulum was a mortality factor as indicated by the fact that 4 of the 6 patients with Meckel's diverticulum required intestinal resection.

There were 8 deaths among 68 patients treated by manual reduction of the intussusception, a mortality rate of 11.8 per cent. Intestinal resection resulted in 6 deaths among 13 patients, a mortality rate of 46.1 per cent. The total surgical mortality rate was 18.2 per cent. There were 3 deaths among the last 45 patients, a mortality rate of 6.6 per cent. Reduction in mortality was due to improved surgical technique and judgment and to advances in preoperative and postoperative care. ERNEST E. ARNHEIM, M.D.

Kay J. H., and Lockwood J. S. Experimental Appendical Peritonitis. The Significance of Imbalance of Circulating Fibrinolytic and Anti-fibrinolytic Factors in the Course of the Disease. *Surgery* 1947 31: 155

The following observations made in a preceding article led to the present study:

1. Appendicitis is of local origin and culminates in an acute toxemia characterized by profound disturbances in the hemodynamic equilibrium and an impaired function of the lungs, liver and vital organs.

2. The systemic character of the disease is reflected by shifts in the concentrations of the normal blood constituents including water, electrolytes, nonprotein nitrogen, total protein, hemoglobin and prothrombin.

3. The outcome of the disease, whether death or survival, appeared to be related to the "condition" of the animal prior to the experiment rather than to any bacteriologic or anatomic variations.

4. Animals handicapped by an abnormal prothrombin time upon entering the crisis of the disease failed to survive, while those with a normal prothrombin time survived. Fluctuations of the prothrombin time tended to co-ordinate in time with fluctuations in the sedimentation rate, whole blood specific gravity and the hematocrit.

The present article is a report of experiments designed to explore the possible relationship between survival from peritonitis and the antiproteolytic activity of the blood. Data of other works reviewed relevant to this study indicate several important points. Intravenous administration of trypsin produces an immediate fall in the blood pressure and a reduction in the amount of circulating fibrinogen possibly by its conversion to fibrin. Prolonged shock produces a similar change. A proteo-

lytic enzyme occurs normally in human serum and is probably related to the normal clotting mechanism. And finally repeated injections of trypsin in rabbits increased the antiprotease activity of the serum.

Experimental peritonitis was produced in 128 dogs and the fibrinolytic and antifibrinolytic factors in relation to the survival were studied in 37 of the group. The fibrinolytic activity of the blood was studied by two methods. First, by simple incubation of recalcified oxalated dog plasma at 37° C. to determine whether spontaneous lysis of the dogs own fibrin occurred within a period of 48 hours. Second dog serum treated with chloroform to remove at least a portion of the nonspecific inhibitor of proteolytic enzyme was added to a standard preparation of bovine fibrinogen. This method the author considered was more a measure of the amount of proteolytic enzyme inhibitor than a measure of the amount of enzyme. The results of the experiments were as follows:

1. Spontaneous lysis of plasma fibrinogen and fibrin occurred in much greater frequency in the animals that died than in those which survived. Lysis invariably occurred in samples drawn within 12 hours preceding death.

2. Sharp fluctuations in available fibrinogen nitrogen were observed during the disease in all of the animals but there was not a clear correlation between the fibrinogen nitrogen levels and the activity of fibrinolytic factors. The animals surviving showed fibrinogen nitrogen levels which were approximately 65 per cent greater than the preoperative values.

3. The fibrinolytic activity of chloroform treated serum was significantly higher in dogs which died than it was in dogs which survived.

4. The preoperative administration of trypsin in amounts sufficient to build up the antiproteolytic activity of the serum had a marked effect upon survival—only 1 of the 15 animals treated with it died. Of the control animals, 41.7 per cent died.

5. Neither penicillin nor heparin were of therapeutic value in the small group treated therewith.

FREDERICK C. HOBAN, M.D.

Miller E. M.: Bowel Obstruction in the Newborn. *Surg Clin N America* 1947 27: 73

The author presents a brief review of the clinical and pathologic features and the surgical treatment of congenital obstructions, mainly atresias, of the esophagus, duodenum, ileum and rectum.

A report of the results of treatment in the author's clinic is limited to congenital obstructions of the duodenum and ileum. There were 7 cures in 11 cases of duodenal obstruction, the number of cases with intrinsic obstruction (atresia) or extrinsic obstruction (incomplete rotation of the colon) is not stated. An antecolic duodenojejunostomy is advised for atresia or stenosis of the duodenum. Two successful results in atresia of the ileum are mentioned, the operative procedures being a side-to-side ileocolostomy and a temporary ileostomy in the proximal loop in both cases. ERNEST E. ARNHEIM, M.D.

Devine, J.: A Concept of Paralytic Ileus; A Clinical Study. *Brit. J. Surg.* 1946, 34: 158.

A review of the literature regarding intestinal obstruction with especial regard to paralytic ileus and intestinal physiology is presented. True or idiopathic postoperative paralytic ileus is rare.

Investigations were made and the following effects on small bowel motility in paralytic ileus were noted:

- 1 Heat and turpentine stupes on the abdomen had no effect on bowel movements.
- 2 Luminal decreased the peristalsis and tone
- 3 Penicillin and sulfonamides did not materially affect the peristalsis.

4. Overdistension of the stomach caused loss of tone and decreased movement of the small intestine.

5. Stimulation of the colon, as by enemas, caused activity of the small intestine.

Postoperative infection is the most frequent cause of postoperative ileus. Three phases of ileus are postulated:

1 Stage 1 in which the movements are active, co-ordinated, responsive to stimulation, and effective

2 Stage 2 in which the movements become irregular, inco-ordinated, and ineffective

3 Stage 3 in which intestinal mobility ceases. Stimulation of the intestine during stage 3 may promote the development of paralytic ileus.

Therapy should consist of prophylaxis by eliminating preoperative cathartics by gentle operative manipulation of the intestine and avoidance of peritoneal contamination; restriction of oral fluids in the immediate postoperative period; minimal use of atropine and barbiturates postoperatively; and no stimulation of the small intestine by enemas or drugs during the period when intestinal movements are irregular, unco-ordinated or absent. Morphine should be used during these periods. When fully developed ileus is present the prompt use of intestinal intubation, intravenous plasma, and fluids necessary to maintain the proper electrolytic balance are urged. If it is impossible to insert an intestinal tube in a patient during a fully developed ileus the author suggests a high jejunostomy and intubation.

The following outline of paralytic ileus is reproduced directly from the author's paper:

- I Intra-abdominal
 - A. Peritoneal irritation
 - 1 Traumatic
 - a. Postoperative
 - b. Penetrating wounds
 - 2 Bacterial peritonitis
 - 3 Chemical
 - a. Extravasation of blood
 - b. Perforated peptic ulcer
 - c. Bile peritonitis
 - d. Acute pancreatitis
 - B Vascular changes
 - 1 Strangulation
 - a. Intramural distension following mechanical ileus

- b Extramural Compression of the mesenteric vessels
 - 1 Mesenteric thrombosis
- C Extraperitoneal irritation
 - 1 Hemorrhage
 - 2 Infection
 - 3 Renal
- II Extra-abdominal
 - Toxic
 - 1 Pneumonia
 - 2 Uremia
 - 3 Empyema
 - 4 Systemic infection
 - B Neurogenic
 - 1 Injuries and diseases of the spinal cord
 - 2 Lead poisoning
 - 3 Fracture of the lower ribs

C. FARMER, KITTLE, M.D.

Mason, J. M. III, and Linn, J.: Lipomas of the Colon. *South. Surgeon*, 1947, 3: 128

Lipomas are found throughout the intestinal tract. They may be subserous or submucous; the latter are considered true lipomas. They may be asymptomatic when small or they may cause symptoms. When symptoms are present they are often due to varying degrees of intussusception. Preparation of the colon with succinylsulfathiazole followed by resection and primary end-to-end aseptic anastomosis with use of the Stone intestinal clamps is a satisfactory method of treatment. This technique when feasible, presents obvious advantages over the two-stage exteriorization type which requires more prolonged hospitalization and operation for secondary closure.

In a recent article on surgery of the colon one of the authors advocated that an aseptic primary end-to-end anastomosis be performed with the use of the Stone clamps in elective, nonobstructive prepared cases when resection of the large intestine is indicated.

They report a case of submucous lipoma of the splenic flexure of the colon. The technique of such an anastomosis is described. HARRIS, W. FIXX, M.D.

Santý P., Dargent M. and Mllehaudi: Résultats de Chirurgie Préservant le Sphincter F. netion in Cancer of the Rectum (Résultats de la chirurgie conservatrice de la fonction sphinctérienne pour cancer du rectum). *Lyon chir.* 946 4: 641

In France there has been a definite trend toward the treatment of cancer of the rectum by conservative surgery and contact irradiation rather than by mutilative surgery and colectomy.

Preservation of the sphincter has been accomplished by two methods: sacral amputation and sacral resection. In the former all of the anal mucosa is removed and the sigmoid is pulled through the sphincteric ring which alone is preserved. In sacral resection a segment of the lower mucosa is preserved and continuity is re-established by end-to-end suture.

Of 90 patients treated by conservative surgery 76 could be followed up. Fifty-one patients were treated by amputation and 25 by resection. The mortality for all types of conservative surgery was 7.7 per cent, the recurrence rate was 6.6 per cent, and the incidence of postoperative metastases was 12.2 per cent. Of the survivors 41.1 per cent had a good functional result, 3.3 per cent had a poor functional result, and 55.6 per cent had a mediocre functional result.

The rectal tumor was located in the ampulla in 47 cases. Thirty-seven of this group were treated by sacral amputation and 10 by sacral resection. Of the former 23 were followed up for a long period and the results were as follows: 15 good, 2 poor, and 6 mediocre. Of the latter 1 presented poor results and 7 presented mediocre results. Thus for ampullary carcinoma the results of resection were inferior to those of amputation.

The rectal tumor was located in the rectosigmoid area in 29 patients. Fifteen were treated by resection and 14 by amputation. Of the 15 resections 11 could be followed up. Seven results were perfect and 4 were mediocre. Of the 14 amputations 13 could be followed up. In 7 the results were excellent and in 6 further treatment was required. Thus, for rectosigmoid carcinoma, the results of resection were better.

To compare these results with those of radical surgery the authors refer to 41 cases reviewed by Bozon and treated by the operation of Lockhart Mummery. Nineteen of these could be followed up for more than 5 years. The mortality was 7.31 per cent or essentially the same as for the conservative group. Seven or 36.8 per cent had no recurrence. Of the conservative group 34 were followed for more than 5 years. Twelve or 50 per cent of the patients survived.

As a basis for comparison of their results with those of contact irradiation therapy the authors cite 28 cases reviewed by Lamarque. Twenty-four patients survived. Eight of the latter were re-examined at the end of 3 years and biopsy showed no evidence of recurrence.

EDWARD W. CIBER, M.D.

Rachet J., and Rey M: Treatment of Cancer of the Anus (Le traitement du cancer de l'anus). *Rev. chir. Par.*, 1946 65 257.

Treatment of cancer of the anus has passed through two stages: one is purely surgical, when the condition is associated with cancer of the rectum and its radiosensitivity is unknown, and the other is almost exclusively one of radium therapy. This explains the dearth of recent surgical statistics. In consideration of the painful sequelae of radium therapy the question as to whether this method is to be recommended for cancer of the anus has been brought up for discussion. Only eminent radiotherapeutists have expressed themselves but no surgeons.

Following a discussion of the advantages and disadvantages of surgical and radium therapy the au-

thors conclude that radium therapy constitutes the most simple method of treatment. Statistically it has not been possible to demonstrate the superiority of either method. The number of cures obtained by the two methods seem about equal. Unfortunately the accepted surgical technique in these cases leaves the patient with the great inconvenience of an artificial anus. Radium therapy spares the patient this burden but is usually associated with severe and painful sequelae. These unfortunate sequelae have been attributed by the radiotherapeutists to the fact that patients have been referred for treatment at too late a stage of the disease, to faulty technique, faulty indications, and the use of excessive doses. Roux Berger and his co-workers have suggested the following course of procedure: always begin with physiotherapeutic therapy and if this fails proceed after 2 or 3 months to surgical intervention.

The authors remain skeptical toward this proposal, believing that if surgery has been found dangerous after certain radiotherapeutic procedures such as radium puncture it will surely prove even more dangerous in these late painful complications with the associated fibrous changes. If it were possible to foretell at an earlier stage that transitory painful reactions would persist and grow worse, surgery might prove helpful. However the course of these complications cannot be foreseen even by the most experienced specialists. It is to be hoped that new techniques and discoveries may be able to prevent these unfortunate sequelae of radium therapy.

Neither surgery nor radium therapy can be considered as having been fairly tested until large series of cases in earlier stages of the disease have been treated by the two methods. Biopsy should be done in all abnormal lesions of the anus associated with induration and failure to heal promptly.

EDITH SCHANCKE MOORE, M.D.

LIVER, GALL BLADDER, PANCREAS, AND SPLEEN

Riopelle, J. L.: The Elastic Tissue of the Gall Bladder. Anatomic, Clinical, Radiologic, and Pathogenic Considerations of a Previously Neglected Lesion of the Gall Bladder (L'élastose du cholesty: Considérations anatomiques, cliniques, radiologiques et pathogéniques sur une lésion jusqu'ici négligée, de la vésicule biliaire). *Union Méd. Canada* 1946 75 1486.

Pathologists have devoted very little attention to the elastic fibers in the wall of the gall bladder. By selective staining of gall bladder specimens one may note considerable variation in the elastic elements of the wall. Usually the elastic tissue is present in limited amounts and predominates at the level of the tunica muscularis in the form of layers or multiple tracts. By more careful search it may also be demonstrated in the connective tissue of the chorion and especially of the adventitia, and even in the serosa. More rarely elastic tissue predominates in the adventitia itself.

The author believes that the presence of these elastic fibers is not a mere anatomical curiosity, but that a study of them clarifies certain aspects of the pathogenesis of cholecystitis. He has reviewed 595 cases of cholecystitis and cholelithiasis and has examined 575 gall bladder specimens. These specimens were sectioned longitudinally as soon as excised and before fixation. Stretching of the specimen was avoided. Positive identification of elastic tissue was obtained by selective staining and was found in 20 specimens. One additional specimen was added to bring the total number of specimens to 30.

In its relation to the musculature, in its configuration and in its texture, the elastic tissue of the gall bladder wall presents the characteristics of a new growth rather than of a simple degenerative lesion. The production of elastine in the adventitia is constantly associated with a variable excess of the same substance either in the musculature or in the connective tissue commonly associated with cholecystitis and cholelithiasis.

The clinical picture of the patients whose gall bladders contained an excess of elastic tissue was characterized less by severity of painful phenomena and more by vague indigestion and reflex phenomena. The duration of symptoms is somewhat longer in this group than in the group with cholecystitis in general, the mean being 7.5 years as compared with 3.8 years. Cholecystography usually reveals a poorly visualizing or nonvisualizing gall bladder. Stones may or may not be present.

The pathogenesis of this elastic tissue is obscure. Senile dystrophy is an unlikely hypothesis and post-inflammatory regeneration theories do not agree with many accepted facts. The author is inclined to favor a mechanical disturbance of the vesicle function requiring a process of adaptation of the gall bladder wall as the chief pathogenic factor.

EDWARD W. GIBBS, M.D.

Santy P.: Drainage in Cholecholestomy for Lithiasis (Le drainage dans la cholécholestomie pour lithase). *Rev. chir. Par.* 1947, 66.

The author analyzes the results of external biliary drainage for the treatment of common duct stone in 183 cases treated in a 30 year period. The first 96 cases were reviewed in 1936 by Aufrère. Although the mortality was 9.6 per cent for the entire group it was reduced to 5.7 per cent for the last 87 cases.

For convenience of discussion the patients have been classified into four groups.

In the first group are included 86 patients who exhibited the classical picture of common duct stone with intermittent crises of pain in the right hypochondrium or epigastrium, fever and icterus. The total mortality in this group was 8.5 per cent.

The second group comprises 28 patients with atypical symptoms in which the characteristic history was lacking; the mortality was 7 per cent.

In the third group are 32 patients with chronic icterus due to retention often produced by a single stone. The mortality was 9 per cent in this group.

The fourth group of 34 patients presented the most severe syndrome of calculous angiocholitis. The mortality in the first 19 cases of this group was 36 per cent but recent advances in preoperative care, particularly vitamin K therapy simplification of the operation and the use of local anesthesia, resulted in a mortality of 6 per cent in the last 15 cases.

The original operation of Kehr was a serious operation performed on enfeebled patients. It carried a high mortality rate. Modification of the operative procedure has simplified it. A right subcostal incision is made only as long as necessary. The liver is not disturbed. The cholecystectomy may be simplified by mere obliteration of the mucosa with the diathermic bistoury.

Exploration of the common duct by palpation and inspection is not adequate in many cases. The author prefers the method of Mallet-Guy to examine the duct by roentgenography with an opaque medium to outline the biliary tree at the time of operation.

External drainage of the common duct should be done with a catheter of fine caliber carefully placed with minute sutures and well peritonized. It is usually removed between the twelfth and twentieth days after the patency of the duct has been confirmed by clamping the tube, and also by roentgenographic and manometric studies. EDWARD W. GIBBS, M.D.

Mallet-Guy P. and Gautier R.: Physiopathologie Study of Recurrences following Cholecystectomy (Etude physiopathologique des récidives après cholécystectomie). *Lyon chir.* 1946, 41, 513.

It is difficult to determine by clinical examination and even by operative inspection the cause of recurrent pain and jaundice after cholecystectomy. However by manometric and roentgenographic study of the extrahepatic biliary ducts during operation one may establish a definite cause for recurrence.

Twenty cases with recurrent symptoms following operation are reviewed. In 6 of these an anatomical cause for symptoms was found. Two patients had calculi in the biliary ducts; 2 had pancreatitis, 1 patient had a tumor of the papilla of Vater and 1 had an operative injury to the ducts. In 14 patients the recurrent symptoms were found to be on a functional basis. Ten patients had hypertony of the sphincter of Oddi and 4 had atony of the sphincter.

The case histories of these patients are reviewed and the intrabiliary pressure curves and roentgenographic patterns made during operation are illustrated and correlated with the anatomic or functional factors responsible for recurrence of the symptoms.

The authors conclude that the majority of these factors exist at the time of the first operation and urge the operator to determine at that time the intrabiliary pressure curve and roentgenographic pattern of the ducts in order that he may institute the proper treatment and prevent the development of recurrences.

EDWARD W. GIBBS, M.D.

Baravalle N: The Pancreatic Syndrome during the Immediate Postoperative Period (Sindromes pancreáticos en el postoperatorio inmediato de la cirugía biliar) *Archiv Roaario* 1946 11 247

Among 400 operations on the biliary system the author encountered 21 cases which were complicated by a postoperative pancreatitis.

Postoperative retention of the pancreatic secretion which occurs not infrequently following cholecystectomy may be demonstrated by the determination of amylase in the urine. In 5 patients the author was able to show the presence of amylase and also bilirubin in the urine after operation. Such observations point to an obstruction of the pancreatic and biliary ducts of a functional or inflammatory origin. Postoperative pancreatitis may cause tachycardia, profuse perspiration, cyanosis, oliguria (due to peripheral vascular collapse), fall of the arterial pressure, pain in the operative region, intestinal paralysis, subnormal or slightly elevated temperature, diminished alkaline reserve and increased hemocoagulation.

Three types of postoperative pancreatitis may be distinguished: (1) the attenuated form characterized chiefly by tachycardia, slight hypotension, oliguria, and the presence of amylase in the urine; (2) the type characterized by a peripheral vascular collapse, in which the pulse frequency may reach 140, the blood pressure falls more and more, cyanosis appears, and typical postoperative shock makes its appearance; and (3) the peritoneal form, characterized by a slight elevation of the temperature, the appearance of amylase in the urine, and symptoms of peritonitis which dominate the picture. The type of anesthesia employed during the operation does not seem to be an important factor. Cholangiography employed in the course of the operation can not be blamed because pancreatitis may develop in patients in whom this method has not been employed. Operative maneuvers such as the insertion of probes into the common duct may be an important factor. Morphine should not be employed preoperatively or postoperatively, because it causes a contraction of the sphincter of Oddi, thus facilitating stasis.

Differential diagnosis must be made from hepatic insufficiency, biliary peritonitis, and operative shock caused by hemorrhage.

As stated, morphine should not be employed before the operation or it should be combined with atropine. Barbiturates are preferable to morphine. The emotional condition of the patient deserves attention because it may affect the sphincter of Oddi. To diminish the reflexes, the author supplements general or spinal anesthesia with injections of novocaine into the abdominal wall and subserosa of the gall bladder. Extreme care should be exercised in exploring the common duct, especially its retroduodenal portion. If the duct is flushed with saline solution, no great pressure should be exerted.

Blood transfusion is indicated in the more severe types of postoperative pancreatitis. Atropine should

be given to relax the sphincter. Ephedrine is very valuable to combat collapse. This drug, as well as atropine, diminishes the pancreatic secretion. Large doses of polyvalent antipangreous serum should be administered. As a rule the prognosis is favorable. JOSEPH K. KARAT, M.D.

Mallet-Guy P, Marion P, and Jeanjean R.: Indications and Results of Left Pancreatectomy for Lithiasis of the Duct of Wirsung (Indications et résultats de la pancréatectomie gauche dans la lithiase du canal de Wirsung) *Lyon chir* 1946 41 661

The surgical treatment for lithiasis of the duct of Wirsung is classically represented by pancreatectomy with extraction of the stone followed by drainage. This procedure carries with it the risk of fistula formation, recurrence, and aggravation of an associated lesion.

The authors review 3 cases in which a left pancreatectomy for lithiasis of the duct of Wirsung was followed by very satisfactory results.

The first patient had 2 stones in the duct, one in the region of the head of the pancreas and the other in the left portion of the body. There was a associated chronic pancreatitis and thrombosis of the splenic vein. A pancreatectomy at two sites in the duct of Wirsung seemed illogical and would seem to offer little improvement for the chronic pancreatitis and venous thrombosis. Hence, all of the lesion to the left of the midline was eliminated by a left pancreatectomy and splenectomy, and the stone in the duct near the head of the pancreas was removed by pancreatectomy. The result has been excellent for 27 months.

The second patient had a right and left pancreatectomy for the removal of calculi, but a recurrence necessitated reoperation 15 months later. At that time an abscess of the left portion of the pancreas was found and a left pancreatectomy was done. This patient was in excellent condition 6 months later.

The third patient with lithiasis of the duct of Wirsung was treated primarily by left pancreatectomy and has made satisfactory progress for 6 months since operation.

Stones in the midportion of the duct of Wirsung produce lesions of chronic pancreatitis in the left half of the pancreas, lesions which simple removal of the stone does not cure. It is the removal of this portion of the pancreas which produces an alleviation of symptoms, even though pancreatectomy may also be necessary for removal of the stone in a more cephalic portion of the gland.

EDWARD W. GIBBS, M.D.

Ballico G: Sarcoma of the Spleen (I sarcomi della milza) *Gior Ital chi* 1946 2 481

The number of cases of sarcoma of the spleen reported and the small number of pages dedicated to the subject in texts motivated the author to report his case.

The percentage of primary tumors of the spleen as compared to all types of tumors has been re-

ported as 65 per cent or 6 cases in 6,500 autopsies. Of these 6 primary tumors of the spleen, 3 were benign (angiomas) and 4 malignant (sarcomas). Carcinoma of the spleen is considered very rare and, when it occurs, is attributed to epithelial cell rests or the inclusion of pancreatic tissue in the parenchyma of the spleen.

In the history it was noted that the patient complained of upper left quadrant pain for the past year. It had been worse during the past 3 months and was accompanied by mild fever. A large palpable tumor was present in the upper left quadrant, extending to the midline and down to the iliac crest. Liver dullness was within normal range.

The urine showed traces of albumin and mucopus, a few hyaline casts, numerous pus cells, and numerous epithelial cells. The hemoglobin was 63 per cent, the red blood count 3,300,000 and the white blood count 10,200.

The diagnosis of sarcoma of the spleen was based on the location of the tumor, age, rapid weight loss, blood picture, and elevated temperature.

A diagnosis of hydronephrosis was made by a consultant called in to see the patient. A descending pyelogram failed to reveal any dye on the left side, but demonstrated a mild hydronephrosis on the right side. A retrograde pyelogram revealed the left kidney to be on the right side and low. This finding was considered to be congenital in nature rather than caused by displacement by the large mass. From these studies hydronephrosis was excluded.

The patient was submitted to an exploratory laparotomy under ether anesthesia, after a transverse incision. An enlarged spleen was found and during the exploration the capsule was torn which permitted the operator to remove some tissue for biopsy study. The tumor was not removable and the abdomen was closed.

The postoperative course was uneventful for 5 days, but then the patient suddenly became gravely ill. She was taken back to her home where she died on the following day. Autopsy was not performed.

The biopsy showed a histological picture consistent with a diagnosis of reticulosarcoma of the spleen. A minute description of the histological picture was given. Reference is made to Oberling's classification of reticulosarcoma, which divides it into differentiated and undifferentiated types, and defines reticuloendothelial sarcoma, reticulomyelosarcoma, and reticulolymphosarcoma, depending upon the evolution of the reticular elements from endothelial, myeloid or lymphatic structure.

LESLIE J. FROEDT, M.D.

MISCELLANEOUS

Imes, P. R.: Abdominal Trauma. *Am J S* 5: 1947 73: 99.

The degree of shock in abdominal trauma is in direct ratio to the extent of the injury represented by the number of viscera involved. Although shock remains the most important factor in the mortality

following abdominal trauma, the recognition of its importance and the emphasis placed on resuscitation in World War II were largely responsible for the improved results. The factors of wounding agent, time lag, the principal viscera involved, and the technical procedures employed appear relatively unimportant. Chemotherapy appears to have favorably influenced the factor of infection in the mortality.

CHARLES BARON, M.D.

Šipek, O.: Abdominal Actinomycosis Treated with Penicillin (Břháal aktinomykosa léčena penikilínem). *Lék listy* 94b, 335.

Two cases of chronic abdominal actinomycosis were treated with penicillin with favorable results. The first case reported was that of a 33 year old woman who had fallen ill suddenly a year previously. The condition was diagnosed as a parametrial abscess on the left side. This was punctured several times and finally drained into the vagina. The drainage tract remained widely open and the process spread rapidly into the lower abdomen and up toward the left kidney. A huge abscess formed and was opened just above Poupart's ligament on the left side. Both drainage tracts were now discharging pus as fistulas; the patient was very much emaciated and so weak that she could not sit up or turn in bed. The condition was considered hopeless and penicillin (15,000 units per 3 hours, for 3 weeks, up to a total of 345 million units) was administered. At the end of this period of treatment the fistulas, including one over the kidney region, had healed; the eosinophils had dropped to 2 per cent; the tissue infiltrations were not confined to the pelvis and the patient had regained her appetite and was able to walk about. A month later she had gained 90 lb in weight and begun to menstruate. She was discharged as cured and has remained so to the present time.

The second case was that of a 37 year old woman who had been operated upon for gangrenous appendicitis a year previously and was now suffering from a large adnexal mass which had perforated into the bladder. A discharging fistula remained in the operation scar and a few weeks later another fistula formed in the old appendical scar. A fluctuating mass had to be incised in the right epigastric region. The pus from this abscess yielded gram positive cocci, bacilli, and the filamentous form of actinomycosis. The condition of the patient became steadily worse; resisted all treatment, and recourse was finally made to penicillin given intramuscularly in 3 hour doses of 15,000 units for a period of 3 weeks. Under this treatment all the fistulas except 1 healed; this continued to secrete sterile pus. Pain ceased, the patient's appetite returned, and she began to walk about. Six weeks later however the condition of the patient suddenly became worse and an abscess formed at the right costovertebral angle and left a wide fistula which discharged fecal material. Penicillin was given by enema, intramuscularly (200,000 units daily for 14 days) and by daily instillations into the abscess cavity (1/3,000 solution). Again

there was dramatic subjective and objective improvement although the fistula from the incised abscess in the back did not close. Three weeks later a third course of penicillin was given. The patient again improved and at present has no pain, temperature, or other symptom. She is stronger, has an appetite, and can get about. There are still 2 small fistulas secreting small amounts of material.

The author ascribes the torpid response of this last case to the devitalized matter which could not be removed from deep in the intestines. The mixed infection present, the weakened condition of the patient before the diagnosis was established, or possibly the acquisition of the actinomycotic organism with penicillin resistance.

JOHN W. BRECKMAN, M.D.

Singleton, A. O.: Surgical Wounds of the Abdominal Wall with Their Favorable and Unfavorable Results. *Am J Surg* 1947 73 333

The author states that surgical incisions in the abdomen, made without regard for the anatomical structure involved, may be truly traumatic wounds. The old well established vertical incisions, particularly in the upper abdomen, are anatomical difficult of closure and hazardous to the patient. Incisions made with the proper regard for the cleavage of the tissues of the abdominal wall, both muscles and fascia, contribute to the comfort and safety of the patient. Such anatomical incisions can be made in proximity to the condition involved, thus insuring greater ease and accuracy in the operation, in addition to leaving wounds that are closed without tension and with a greater security to the patient post-operatively.

CHARLES BARON, M.D.

Allert, F.: *Ascariasis in Surgery* (Sull ascarioidi in chirurgia). *Polidinica scz. prat.* 1946 53 1155

Ascaris lumbricoides is one of the most common parasites in the human intestinal tract. Other forms of *ascaris* found are *ascaris texana* and *ascaris maritima*. The latter are found only rarely. A description of the worm and its development is given. The question of an intermediate host is raised and Stewart is said to believe it is the mouse *Mus musculus* that is responsible. Most authors however do not believe that the intermediate host is necessary.

Ascariasis is found in any part of the globe, most frequently in tropical and subtropical countries and in negroes. According to Soares Hungria 90 per cent of the population in Brazil is affected. In Italy it is most frequent among children in the country, probably because of their playing in the dirt. It is also found in the adult and in the cities. It is rare in children under 1 year of age and in the aged. The most common site is the small intestine where it is found in small but sometimes large numbers. As many as 1,000 worms have been found in a patient with obstruction. They are sometimes found in the biliary and pancreatic ducts. A case is cited in which a cavity in the liver as large as an orange was found.

Appendicitis has been reported as being caused by the worms, especially in children. The presence of

ascariides in the peritoneal cavity has been reported but the pathogenesis is not clear. It may be due to actual perforation or else secondary infection following abrasions in the mucosa. The possibility of secondary invasion following perforation due to other causes must also be considered.

The most common complication caused is intestinal obstruction. This is usually caused by a large number of worms. In some cases, it may be caused by spasm produced by irritant secretions. The most common site is the distal end of the small bowel. The grouping of the worms into a large mass is said to be due to excessive peristalsis induced by action of the worms or their secretions, or to purgatives or drugs used for treatment. The mass may also cause a volvulus or intussusception of the involved bowel.

The symptoms of obstruction are intermittent pain, distention, failure to have bowel movement or the expulsion of gas, hiccups, vomiting, a rapid thready pulse, and a palpable sausage-like mass. The complete obstruction is usually preceded by signs of incomplete obstruction for several days, which gradually progress. A rapid onset of symptoms should lead one to suspect volvulus.

The author describes 4 cases in which he has personally operated. In the first one the small bowel was opened and the worms were removed. The opening was closed with two layers of catgut. In the remaining 3 cases however the mass was broken up and moved on into the cecum by manipulation. This was followed by the administration of *santonina* in the usual dosage on the following day with good results. A complementary appendectomy was performed in 3 cases. In 2 cases there was a torsion of 180 degrees of the involved loop but no disturbance in the circulation. In no case was the diagnosis made before operation. Two cases were diagnosed as obstruction and 2 as appendicitis.

The author advocates this form of treatment when the viability of the bowel is not compromised rather than enterostomy for actual removal of the worms. Complementary appendectomy is also advocated.

Reference is made to authors who advocate medical management of these cases with purgatives and anthelmintics. The author believes that this might be practiced in cases of incomplete obstruction but should never be done when the obstruction might be complete.

LOUCIAN J. FRONZONI, M.D.

Yódice, A.: Postoperative Adhesions (Adherencias post-operatorias). *Rev As med argent* 1946 60 911

Although spontaneous adhesions are formed by a proliferative process in which the reticuloendothelial system plays a part, other factors such as microbic toxins, and irritation of the peritoneum by surgical intervention (including the insertion of drainage tubes, handling of the mesentery and the placing of compresses especially when they are too hot) are etiological agents. Dust in the operating room, powder from gloves, and foreign bodies introduced during the operation must also be included as causes.

The symptoms produced are not primarily related to the adhesions themselves but to the intestinal obstruction which they produce. This obstruction, which in the majority of cases is of a chronic type, results in pain that starts in the area of the incision and radiates to all parts of the abdomen. Audible bowel sounds accompany the pain, and are relieved either by the expulsion of gases or by defecation. X rays show a delayed emptying time or a segmental dilatation of the intestine. Although the extent of the adhesions is in direct proportion to the magnitude of the operation, the adhesions usually appear one year following surgery. The fact that the type of pain occurring postoperatively is the same as was present preoperatively may be explained by the fact that acute appendicitis produces adhesions which give rise to pain; however, on removal of the appendix more adhesions form which give rise to pain that is worse than that experienced before the operation.

The following recommendations to prevent adhesions are given:

1. Spinal anesthesia should be used to relax the viscera.
2. The peritoneum must be handled carefully.
3. Compresses should be used only when there is a possibility of spread of infection to other parts of the abdomen. When they are used they should be

dipped in saline solution not more than from 22° to 30° C. in temperature.

4. The abdominal cavity should be cleansed with low pressure suction.

5. There must be no dust in the operating room.

6. The operator's gloves should be washed to remove powder.

7. Vessels inside of the peritoneal cavity should be ligated.

8. Closure of the abdominal wall from the xiphoid to the umbilicus should be accomplished with fewer sutures and the aponeurosis of the rectus should be only loosely approximated. The use of stainless steel wire in sizes of 30, 32, and 35 is advocated. In the closure of the linea alba, the sutures should be $\frac{3}{4}$ cm. apart. In paramedial closure the suture should include the peritoneum and the posterior and anterior aponeurosis of the rectus.

9. In combating infection, only a solution of sulfa at a pH of 7 should be used, as sulfa powder produces adhesions.

10. A solution of papain gives the best results in preventing adhesions, while sterile liquid vaseline, sterile olive oil, collubiazol and the surgical solution of prontosil, stopton, and daganan are not advocated.

1. The use of heparin is dangerous.

ARTHUR F. CIRIELLO, M.D.

GYNECOLOGY

UTERUS

Ahlborg G. On Conservative Myomectomy. *Acta obst. gyna. scand.* 1946 26 Supp. 6

In an extensive and detailed monograph the author first presents a careful analysis of the literature devoted to myomectomy. This examination shows essentially that no conclusive proof has been presented of the relative advantages and disadvantages of myomectomy as compared to the more radical hysterectomy for the treatment of uterine fibroids.

The author then records in an equally meticulous exposition the primary and secondary results of his own material which comprises 283 abdominal and 46 vaginal myomectomies performed between 1923 and 1941 at the Upsala University Hospital and the Stockholm General Maternity Hospital. 572 hysterectomies for fibroids performed within the same period, are included for comparison. All operations were done under the direction of the same principal surgeon. The methods of preoperative and postoperative care, and the technique of the operations are presented.

Ninety six per cent of the patients subjected to myomectomy were questioned and re-examined a mean period of 6.63 years after operation. Of these 78 per cent were completely symptomless, 19 per cent presented various complaints such as pain and menorrhagia, but were not seriously impeded in their activities and 3 per cent underwent radical operation for recurrence.

Of 93 patients who were subjected to enucleation of one or more fibroids and were in a position to conceive after undergoing operation, 39 (51 per cent) actually became pregnant. 31 of these maintained pregnancy to term or had slightly premature deliveries. The average age of the 8 women who suffered miscarriage was 38.1 years, an age when, the author points out, the risk of miscarriage is ordinarily high. On the whole the course pursued in the pregnancies was normal. During the period of observation, the women concerned gave birth to 34 children. All patients survived. One of the infants whose birth was quite premature, died. Of 24 women experiencing their first delivery after enucleation 14 were primiparas. Of these 9 had spontaneous deliveries, 1 was delivered by cesarean section and 4 were delivered by forceps. Of the 10 women who had previously given birth to children at least once before operation 8 were delivered spontaneously and 2 by forceps. In none of the cases of pregnancy was there a threat of rupture of the uterus.

The author believes that certain of these cases help to clarify the possible influence of uterine fibroids on sterility. In the cases of 5 patients, sterility had persisted from 3 to 15 years before they submitted to myomectomy. The tubes and ovaries as seen at operation were normal. All these patients

became pregnant within a year of the operation. The author concludes that in all probability sterility was cured as a result of the myomectomies.

The conclusions drawn from a survey of the literature and the author's series of cases are presented. The uterus should as far as possible, be left intact during the reproductive period. On the whole, the advantages of a conservative operative approach to fibroids giving rise to symptoms outweigh the disadvantages. In other words preservation of the uterus with retention of the frequently resulting ability to conceive and menstruate outweighs the threat of recurrence and the possible persistence of symptoms. Conversely a radical operation for fibroids will almost always result in a complete cure of symptoms, but the uterus will be sacrificed. The choice between the two modes of procedure must be individualized by reference to the patient's personal history, her social situation and individual preferences, her obstetrical history and other factors. In the presence of sterility it may sometimes prove justifiable to enucleate myomas which are otherwise symptomless. L. JAMES TALBOT M.D.

Blanchi P.: Therapeutic Possibilities in Cancer of the Uterus in Young Women (Sulle possibilità terapeutiche del cancro uterino giovanile). *Rev. ostet. gina.* 1946 1 113.

Eighty-seven cases of uterine cancer in women under 35 years of age are reviewed statistically. These patients came to treatment at the obstetrical and gynecological clinic in Florence, Italy. All of the tumors were primary in the uterus, 76 were located in the cervix and 11 in the body of the uterus. Of the 76 cervical cancers, 27 were in the first and second groups of Schmitz' classification, and of these 15 were treated by hysterectomy alone, 10 were irradiated and 2 were treated by hysterectomy but the operation preceded or followed irradiation therapy. Five year survivals occurred in 7 (83.3%) 6 (85.7%) and 2 (100%) cases, respectively.

Forty-two patients were classified as belonging in the third group of Schmitz' classification and of these, 8 were operated upon, 16 were irradiated, and 7 were treated by the combined method. The respective 5 year survivals were 0 (0 per cent) 20 (28.5 per cent) and 1 (20 per cent). In addition, 1 of these patients was treated only medically and died within a year. There were 7 inoperable cases in the fourth group of this classification, 2 of these were given irradiation treatment and 5 medical. There were no 5 year survivals. These percentages are based on only 18 patients in the first group, 31 in the second, and 6 in the third (Schmitz' fourth group) who could be followed up for 5 years, or until their deaths. The author favors the combined method of treatment for the first and second groups and irradiation alone for the rest.

Of the 11 patients with carcinoma of the body of the uterus 9 were hysterectomized and 2 were treated by irradiation. Seven of those hysterectomized and both of the patients treated by irradiation could be followed up for 5 years and all were found to be alive and well at the end of that time. There was 1 surgical death in this group and the author raises the question whether exclusive irradiation is suitable for these cases, however he does not feel that he should criticize this common practice on the basis of only 3 cases.

The author recommends further clinico-statistical study of these cases which on the basis of his figures are not so rare as commonly believed.

JOHN W. BRIDGES, M.D.

Pons, L. M.: Radiotherapy of Cancer of the Neck of the Uterus (Tratamiento radioterápico del cáncer de cuello uterino) *Boi Soc obst gine. B Aires* 1946 25 368.

Because of the location of cancer of the neck of the uterus, biopsy is easily accomplished and serial sections of the sample obtained should be examined. By this means the status of the cancer and its amenability to treatment can be determined. This is done by observing the mitosis, vacuolization, phagocytosis and condition of the nuclear and chromatic substances. The sensitivity of the tumor to radiotherapy may be judged by the degree of changes in the various cellular constituents. From animal experimentation it was shown that the best results from radiotherapy were obtained when the circulation to the parts was unaltered by any operation performed previously.

Examination of the cancer should reveal the grade of the tumor from which the prognosis may be determined. Histologically there are two types to be considered: one in which the cells are undifferentiated and the other in which the cells are discernible. The first is radiosensitive and the latter is more or less radioresistant.

There are four groups into which cancer of the neck of the uterus may be classified:

1. The type in which the lesion is limited to the neck alone. This form is amenable to Wertheim's operation and radiotherapy. It has been referred to as the precancerous lesion.

2. The type in which there are beginning cancerous changes with a tendency toward extension to the uterus, parametrium, or vagina.

3. The type in which the cancer is definite and there is infiltration into the rectum, parametrium, and all adjacent structures with fixation of the organs involved.

4. The type with all the features of type 3 and with vesicovaginal and rectovaginal extension and metastasis to distant organs.

Treatment is regulated according to the radiosensitivity or radioresistance of the tumor. The dosage should not exceed the resistance of the vaginal cells. The method of applying the radium cartridges and the quantity for each location are given. It is be-

lieved that the results of telecurietherapy are inferior to those obtained when focal curietherapy is combined with regional roentgen therapy.

The patients are divided into three groups: (1) those with fever, (2) those with neoplastic infiltration into the vagina, and (3) those with hemorrhage or with a cauliflower type of lesion.

In the beginning the first and second groups are given roentgen treatment, and the third group is given radium treatment, the radium being inserted with a tampon if necessary. The various reactions and accidents which might occur during the course of therapy are discussed.

STEPHEN A. ZIDMAN, M.D.

ADNEAL AND PERIUTERINE CONDITIONS

Valla, G. and De Gaudenzi, C.: Histologic Characteristics of Cutaneous Tumors in Dermoid Cysts of the Ovaries (Caratteristiche istologiche del tessuto cutaneo nelle cisti dermoidi dell'ovale) *Ginecologia Tor* 1945, 2 355.

The pathogenesis of ovarian embryomas is still obscure and there is no agreement among authors as to their proper classification. Two groups may be distinguished: (1) dermoid cysts with sebaceous contents, of benign character, and (2) teratomas in the strict sense of the word, which are usually solid, have a tendency toward malignant degeneration, and may be considered as true blastomata. The term "teratoma adultum" has been applied to dermoid cysts, and the term "embryonal teratoma" to immature formations. A subdivision into epidermoid cysts, true dermoid cysts (containing skin, hair and glands), complex dermoids (containing teeth and osseous structures) and complex teratomas (containing various tissues and organs) is not justified because all such formations possess plurigerminous properties.

According to one hypothesis, dermoid cysts of the ovaries derive from the residue of the wolffian bodies. Another theory maintains that metaplasia of the cells of Pflüger's tubules is responsible for the formation. Another school of thought holds that parthenogenesis is the responsible factor and according to some authors, the dermoid cysts derive from aberrant somatic blastomeres.

The authors' histologic studies showed that all structures found in dermoid cysts are homologous to tissues of the adult organism. The authors gave particular attention to the study of the epidermis, dermis, elastic tissues, sebaceous glands, sudoriferous glands, and the hair and its follicles. No deviations from similar normal structures of the adult organism could be found with the exception of very slight variations in the structure of the hair. The authors conclude from their investigations that Wilms' concept of the genesis of dermoid cysts is correct. The formation may be considered as an ovarian parasite or rudimental embryo capable of giving origin to any kind of organs or tissues.

JOSEPH K. NARAY, M.D.

Fortini E.: A Clinical Contribution to the Subject of Tubal Antiperistalsis (Contributo clinico sull'antiperistaltica tubarica) *Riv. obst. gin.*, 1946 1 105

A 36 year old married woman who had had 3 previous normal deliveries and nothing suggesting an adnexitis at any time, suddenly developed menstrual irregularities and was brought to the hospital with pains in the lower abdomen and constant although not serious metrorrhagia. Palpation, which was very painful, revealed a large soft uterus and a large sausage shaped mass in the pouch of Douglas to the left of the uterus. Puncture of the pouch released about 30 c.c. of dark colored blood together with a few small clots. Laparotomy uncovered a large firm whitish clot in the pouch and the sausage shaped mass which proved to be the tube with the pavilion and a portion of the ampulla invaginated over the proximal portion of the tube. The left tube was excised, which was followed by recovery.

Microscopic examination of the excised specimen exhibited evidence of a chronic inflammatory process everywhere in the tube but no sign of a polyp or other tumor or process to correspond to the usual concept of the origin of the invaginative process in the intestine. There was no evidence of nidation of the ovum indicating tubal pregnancy however the clotted mass lying free in the pouch of Douglas was found to contain syncytial and Langhans cells.

The author believes that this was actually a case of tubal abortion provoked by the painful palpatory examination and that the process of invagination was initiated by powerful antiperistaltic contractions of the smooth musculature of the tube.

JOHN W. BRIDGEMAN, M.D.

Murray E. G., and Cirio M. A.: Primary Tubal Epithelioma; Observations (Epitelioma tubario primitivo Dos observaciones) *Bol. Soc. obst. gin. B. Aires* 1946 25 435

Primary tubal epithelioma is a relatively rare lesion. This article presents in detail the twelfth and thirteenth case histories of the disease to be reported in the national literature of Argentina.

The first patient was a 57 year old female whose symptoms included a leucorrhoea and the existence of a fixed parametrial mass. At operation total hysterectomy was done and the microscopic diagnosis revealed an alveolopapillary epithelioma with extension to the ovaries, the broad ligament, and all layers of the uterus. STEPHEN A. ZIEGLER, M.D.

EXTERNAL GENITALIA

Meigs, J. V.: The Vaginal Smear *J. Am. M. Ass.* 1947 133 75

In 1923 Papanicolaou demonstrated his ability to make a diagnosis of cancer of the uterus by the observation of single malignant cells in the vaginal secretion. At the Massachusetts General Hospital, Boston 2 749 cases were studied with an error of only 3.2 per cent in diagnosis.

A positive smear indicates that careful further studies both by smear and by biopsy are indicated. A negative smear indicates that at the time it was taken cancer cells were not found on the slide. If the appearance of the cervix is suggestive, more smears must be taken because in certain instances shedding of the cells does not occur. Six and one-tenth per cent of 339 cancers did not show malignant cells. The smear diagnosis is important, but how far one is to go in the treatment of patients with a positive smear and a negative biopsy has not yet been decided.

Directions for staining methods or the method of diagnosis of individual cells have been included in numerous articles and in Papanicolaou and Traut's monograph. The nucleus of the cell is the main diagnostic criterion. The cancer cell has a large abnormal nucleus, and in groups a variation in size and shape is obvious. The large nuclei of cells from cervical cancer are radically different from those of the normal cells of the cervical epithelium. It is important to note the paucity of cytoplasm compared to the amount seen in the normal cell. In the cancer cell the large nucleus takes up most of the cytoplasmic space and the ratio of nucleus to cytoplasm is different from that in the normal cell. In cancer of the endometrium the same criteria are true but there is less variation in the size and shape of the nucleus. The presence of histiocytes and many leucocytes is a suspicious observation but is not diagnostic. The most important observation is the abnormal nucleus and its size in relation to that of the rest of the cell. Diagnosis by vaginal smear is painstaking and slow, and 30 minutes is not too long for the examination of a slide. Well trained technicians should be used to screen out negative slides, but in the process of screening suspicious cells should be noted, marked, and presented to the expert for final decisions.

It is easier to diagnose cancer of the cervix than cancer of the endometrium. It is obvious that the individual cancer cells are cancer cells, and even though the tumor cannot be found at biopsy never theless it must be there. The number of errors for false positive smears is now at 2.0 per cent. It is possible also for the cytologist to miss cancer when it is present in the patient. In 3.5 per cent of the cases of cervical cancer in which the slides were called negative, re-observation still did not show signs of tumor cells on the slides.

In the diagnosis of cancer of the endometrium there is an occasional confusion in calling cells malignant that are definitely not cancerous, and vice versa. The diagnosis of endometrial cancer calls for more expert observation than does that of cancer of the cervix. The error of false negative observations in endometrial cancer is 2.0 per cent.

In the series of 2 749 cases are included 339 cases of cancer. In 25 of these either carcinoma was unsuspected before a vaginal smear was taken or the vaginal smear was of great aid in the primary diagnosis.

The vaginal smear is of special value in following up cases of carcinoma treated in the past by radia-

tion, in which the patients are watched routinely in the tumor clinic for possible recurrence of their disease. It may be impossible to tell clinically whether disease is present, and it is difficult to obtain specimens for biopsy from irradiated patients so that some screening method by which certain cases can be chosen for further study is of great value.

This method is not an office procedure. It should be interpreted by those trained in cytology and in the smear method of making a diagnosis.

DANIEL G. MORTON, M.D.

MISCELLANEOUS

Wharton, L. R.: Congenital Malformations Associated with Developmental Defects of the Female Reproductive Organs. *Am. J. Obs.*, 1947, 53, 37.

Although ovarian failure is often due to some endocrine disorder which secondarily affects ovarian function, there are certain cases in which this failure to function is due to agenesis and lack of follicular epithelium. The characteristic feature of this condition is a complete lack of ovarian epithelium. Serial sections of the ovary in the case of a woman with this condition failed to show any ovarian follicles. Individuals of this type show a complete lack of development of the breasts or reproductive organs, amenorrhea, and a lack of function of the ovaries. Other endocrine glands are normal. The author points out that many of these patients have other abnormalities of a generalized nature, such as retardation of growth, coarctation of the aorta, webbed neck, eye defects, congenital deafness, spina bifida, and mental retardation. This leads to the suspicion that the genetic fault is general and one of germ plasm defect. Since in these cases there is no other defect of the urogenital tract, it appears that the agenesis is present in the primordia of the germ cells and that it is there before the cells migrate to the gonadal folds. This would also suggest that germ cells do not originate in the urogenital folds. Since these cases developed female features normally and in the absence of any ovarian tissue, it seems as if sex differentiation takes place in the fetus without control of the gonad of the fetus.

Malformations of the müllerian ducts, bicornuate uterus, absence of the uterus, absence of the vagina, and vulvovaginal anus are often associated with abnormalities of the urogenital tract. Such cases are reported with findings of ectrophy of the bladder, ectopic kidney, horseshoe kidney, absence of a kidney, and ureteral malformations. The clinical value of routine intravenous urography in the presence of reproductive tract anomalies is stressed.

JOHN R. WOLFF, M.D.

Zondek, B.: Sterility in Woman. *Harvard Tel.* A 1, 1946, No. 2.

Only selected aspects of sterility are discussed. The observations are based on a personal material of 2,000 patients treated in the last 9 years.

There is a relation between cervical stenosis and

sterility. In spite of the relatively small size of sperm cells. A sound is usually passed into the uterus, though the author is not impressed with this maneuver as a therapeutic measure. The author found about 3 per cent of cases to be due to retroflexion of the uterus. He believes the explanation to be (1) the increased congestion of the endometrium, making it unsuitable for nidation, and (2) the kinking of tubes incident to this condition. He believes also that it should be treated by the Alexander Adams' suspension operation, which operation he performs in 10 to 15 minutes. His rate of success has been about 40 per cent. Other causes of sterility must of course have been ruled out. Eleven per cent of anovulatory cases were found. It is probable that the anovulatory cycle is common both during maturation and the climacterium. However it is wrong to ascribe sterility to a persistent anovulatory state on the basis of the result of a single examination.

The author believes that "uterine glycopenia" is a cause of sterility, this he found in 15.4 per cent of sterility cases. The diagnosis is based upon a chemical analysis.

The properties of the tubes play an important role in sterility. The two diagnostic methods are x-ray examination of the tubes by metroradiography and the method of insufflation of J. C. Rubin. Both methods are designed to show whether the tubes are patent but do not indicate whether the ovum can pass the tubes. Sterility can result if the tubal aperture is excessively distant from the ovary. Minute changes of tubal function can lead to sterility. Proper tubal function depends upon (a) tubal musculature, (b) nervous mechanism, and (c) hormonal stimulus.

As well as being diagnostic, the application of the methods discussed can in certain cases also be of definite therapeutic value.

Tuberculosis of the genital organs and its relation to sterility is important in Palestine. Zondek found, in a total of 950 curettages, 1 per cent of cases of tuberculosis of the uterine mucosa. None can say in what percentage of sterility cases tuberculosis of the adnexa is the responsible factor. If a diagnosis of tuberculosis of the uterine mucosa has been made, salpingography and perturbation are definitely contraindicated. Pregnancy is not impossible although tuberculosis of the uterine mucosa may be present.

With regard to tubal obstruction, hope for success exists only if the obstruction is caused by adhesions at the abdominal ostium of the tube. A cure of tubal obstruction which arises from an internal inflammation is very unlikely. Salpingostomy is therefore an operative intervention which hardly deserves to be called a therapeutic measure.

Myomectomy was performed in 113 cases of myoma. Twenty-six of the patients in this group later became pregnant and gave birth to healthy children. The percentage of success was therefore about 23 per cent. In cases in which delivery by cesarean section had been necessary, the author was impressed by the absence of any recurrence of the myoma and by the normal aspect of the uterus.

Endocrine disturbances as a cause of sterility are touched upon briefly. The fact that administration of small quantities of estrogenic hormone can lead to favorable results in cases of sterility is insufficiently appreciated. The results of administration of gonadotropic hormone in women have not so far been satisfactory.

In some cases disturbances of general metabolism lead to sterility. Hypothyroidism is especially important in this connection.

The author concludes with an appeal: Honor the sanctity of the fertilized ovum!

DANIEL G. MORTON, M.D.

MacLeod, D.: Endometriosis; A Surgical Problem. *Brit J Surg* 1946 34: 109

The term endometriosis implies the invasion by the endometrium of tissues to which it is foreign. Of the sites in which such invasion takes place, the uterus, ovaries and the peritoneum of the pouch of Douglas are by far the most conspicuous and the literature on this aspect of the subject is already very large. From time to time, however, cases are recorded in which the focus is situated in tissues either just outside of the genital tract, as the bowel, the navel, bladder and ureter or on the very fringe of it, such as the round ligament in the groin or the perineum.

In the author's Hunterian Lecture he deals mainly with extragenital endometriosis first, because not much has been written about it and second, because it is of interest to all surgeons whose province is the abdomen and third, because it throws a light on the much debated questions of genesis and method of spread of endometriosis in general.

In its simplest form endometriosis arises by direct invasion. Direct invasion however does not explain the appearance of endometrial tissue in situations remote from the uterus, and Sampson produced the implantation theory, which states that endometrial cells pass through the fallopian tubes during menstruation and become implanted on the ovary and other structures in the pelvis, particularly the peritoneum in the pouch of Douglas.

Ivanoff and others advanced the serosal theory which holds that under certain conditions the peritoneum has the power to undergo metaplasia and reproduce tissue resembling endometrium because it is developed from the same structure as the uterine mucosa, namely the splanchnopleure.

Finally there is the view that endometriosis arises by lymphatic spread from the uterus, in much the same way as a malignant neoplasm metastasizes by means of the lymphatic system. Strong support for this view has been afforded by the discovery of islands of endometrial tissue in the lymph glands and even in the lymphatic ducts themselves.

The phenomenon of endometriosis is unique in this respect that a whole normal adult tissue—not a single type of cell—transplants itself and grows in tissues foreign to it. Throughout active sexual life the endometrium is renewed every month with the

result that it never grows old. In fact, it is a Peter Pan among tissues perpetually retaining that vigorous growth propensity which makes it peculiarly suitable for tissue culture. Human endometrium was grown successfully in vitro.

In the case of endometriosis of the ovaries and pelvic peritoneum the most popular explanation is the spill theory of Sampson and this theory is also adequate as far as surface endometriosis is concerned.

However from a survey of all the facts, endometriomas wherever they occur are the result of lymphatic permeation of the endometrium. The occurrence of tubal spill cannot be absolutely disproved, but when we have a hypothesis adequately covering all the known facts it seems unnecessary to put forward a second one which accounts for only a few of them.

Endometriosis must be accorded a position somewhere between benign and malignant growths, two separate states of which the true relation has so far escaped the most searching scrutiny.

Is it too much to hope that further study and research regarding this problem will reveal the key to the essential nature of malignancy itself?

HARRY W. FINK, M.D.

Ahumada J. C. and Nogués, A. E.: Perforating Fornical Endometriosis. 12 Cases (La endometriosis fornical perforante: a propósito de 12 observaciones). *Obst gín inf-amer* 1946 4: 651

Of 5,600 gynecologic conditions treated in the authors' clinic, 3.6 per cent (12 cases) were endometriosis with rectovaginal extension and vaginal perforation.

The symptomatology included metrorrhagia, intermenstrual bleeding, rectal pain on menstruation and defecation, and symptoms of occlusion.

Examination showed nodular infiltration which varied in appearance according to the stages of development of the lesion. There were three types: the solitary lesion with apparently normal adjacent genital organs, the endometrial adnexal transplant, definitely an extension from the adjacent ovary, and the lesion with uterine involvement and infiltration and spreading from the vagina.

Treatment depends upon the state and age of the patient, and the degree of extension of the lesion. When surgery is no longer feasible, roentgenologic castration is indicated. Radium seems to produce little benefit, but complete extirpation offers a good prognosis. A detailed report of 12 of such cases is appended.

STEPHEN A. ZIEGLER, M.D.

Hertig, A. T. and Sheldon W. H.: Hydatidiform Mole—A Pathologicoclinical Correlation of 200 Cases. *Am J Obst* 1947 53: 1

The purpose of this report is to determine what, if any correlation exists between the histologic appearance of a hydatidiform mole and the subsequent clinical course of the patient with respect to the development of chorionic malignancy. The authors have examined a series of 200 hydatidiform moles.

gathered consecutively over a period of 11 years from 100 medical communities in the eastern half of the United States. Follow-up data on 94.5 per cent of all the patients are available.

The authors have classified hydatidiform moles into the following six groups according to their histological morphology:

1. Benign hydatidiform moles—no hyperplasia to slight hyperplasia of the trophoblast.
 2. Probably benign hydatidiform moles—slight to moderate hyperplasia of the trophoblast.
 3. Possibly benign hydatidiform moles—hyperplasia with slight anaplasia of the trophoblast.
 4. Possibly malignant hydatidiform moles—variable hyperplasia and moderate anaplasia of the trophoblast.
 5. Probably malignant hydatidiform moles—variable hyperplasia and marked anaplasia of the trophoblast.
 6. Malignant hydatidiform moles—exuberant hyperplasia and marked anaplasia with the trophoblast often invading the endometrium.
- a. Chorioepithelioma *à suu*—morphologic malignancy plus endometrial invasion
 - b. Syncytial endometritis—accentuation of syncytial placental site plus chronic infection
 - c. Choroidadenoma destruens—invasion of myometrium by malignant mole but without metastasis.
 - d. Choriocarcinoma—variable picture in uterus but invariably metastases cause death.

There is a marked but not an absolute correlation between the degree of apparent molar malignancy and the tendency of the patient to develop some grade of chorionic malignancy. In 73.5 per cent of the entire series there was no subsequent development

of either pathologic or clinical malignancy as judged from the follow-up data available in 90.5 per cent of the cases in this particular group. Various grades of chorionic malignancies (group 6) occurred in 26.5 per cent of the entire group. The prognosis of all grades of chorionic malignancy is good except for the relatively uncommon (3%) invariably fatal choriocarcinoma. In the first three grades of chorionic malignancy which are all curable if properly treated, clinical evidence of malignancy is usually shown by continued postmolar vaginal bleeding and/or subinvolution of the uterus. A policy of clinical watchful waiting may be followed until such objective evidence of malignancy develops without increasing the danger to the patient from chorionic metastases. Such individual clinical conservatism will save many uteri that might otherwise be needlessly sacrificed in haste merely because the patient has passed a hydatidiform mole.

Chorionic gonadotropic hormone tests are of little or equivocal value during the period when treatable clinical malignancies are first developing—an average of 35 days after expulsion of the mole. However, postmolar vaginal bleeding and subinvolution of the uterus are invariably present and indicate the need for at least a uterine curettage with the probability of a subsequent hysterectomy. Curettage was often done in this series, which shows that the operation *per se* does not increase the danger of subsequent metastases. By the adoption of a conservative attitude of scientific apprehensive expectancy many uteri that are now needlessly removed will be saved without appreciable increase if any of the death rate from chorionic malignancy.

JOHN R. WOURT, M.D.

OBSTETRICS

PREGNANCY AND ITS COMPLICATIONS

Harris, R., Tchertkoff I. G., and Greenwald, L.:
Acute Leucemia and Pregnancy *Am. J. Obst.*,
1947 53 142

The authors report the combination of acute myelogenous leucemia in a 34 year old gravida 2 who was 5 months pregnant at the time of her admission to the hospital. At that time she entered because of a severe respiratory infection. The leucemia was diagnosed by a routine examination of the blood at that time. It was confirmed by bone marrow examination.

Penicillin therapy controlled the infection but did not influence the blood picture. A spontaneous abortion occurred shortly following her admission to the hospital. An autopsy on the stillborn fetus showed a normal blood picture. The patient had 2 recurrences of sepsis and died 20 weeks after the original admission to the hospital. There was no autopsy.

JOHN R. WOLFF M.D.

Philpott N. W., Latour J. P. A., and Van Dorsser G. J. L.: Review of Cases of Rh Isoimmunization during the Past 5 Years in the Royal Victoria Montreal Maternal Hospital *Am. J. Obst.* 1946 52 926

The authors review the cases of 1214 obstetric patients delivered during the 5 year period ending December 31, 1945 for the purpose of studying Rh isoimmunization as a cause of hemolytic disease of the newborn. The review yielded 37 cases, diagnosed clinically, of which 30 were subsequently considered as proved an incidence of 2 in 404. Among these 30 cases there were 19 live births. Thirteen of the infants are still living 8 are normal 3 are definitely subnormal and the condition of 2 is unknown.

Hemolytic disease of the newborn occurred most frequently in the second and third pregnancy. Rh antibodies were demonstrable in the majority of mothers postpartum. Fetal mishaps were of high incidence in the total number of pregnancies in these mothers but no other complications of pregnancy could be related to Rh isoimmunization. Interruption of pregnancy at the thirty-sixth week has not yielded good results.

Analgesia and anesthesia at the time of delivery must be well chosen. Any type which diminishes the oxygen-carrying content of maternal blood should be avoided. Early diagnosis is essential in the adequate treatment of the affected baby. The babies of all Rh-negative mothers whether they exhibited antepartum antibodies or not are typed for the Rh factor immediately after delivery. Daily hemoglobin estimations are done on all Rh-positive babies for the remainder of their stay in the hospital. If the hemoglobin level of the heel blood is below 90 per cent at birth or if the daily drop is more rapid than normal estimations are done two or three times

daily and repeated small transfusions (10 c.c. per pound) of Rh-negative whole blood are given. Mother's milk is interdicted because of the high titer of Rh antibodies in some patients.

JOHN R. WOLFF M.D.

Raynaud, R. and D Eshougues, J. R.: The Pathogenesis of the Herpes of Gestation (A propos de la pathogenie de l'herpes gestationis) *Ann. endocr.*,
Par., 1946 7 238

A septipara 39 years of age developed generalized herpes at the fifth month of pregnancy which persisted until term and cleared up promptly after delivery. The lesions were grossly symmetrical and involved the whole body except for the palms, soles, and external genitalia. They appeared in crops and caused intensive and painful pruritus. The blood count revealed a leucocytosis of 15,000 with 27 per cent eosinophils. The herpes vesicles contained eosinophils in great number to the exclusion of all other cellular elements.

For 6 months after delivery the patient was free of symptoms. Then, simultaneously with the first menstruation a violent new attack occurred. The lesions were erythematobullous, the temperature rose to 40° C. and profuse uterine hemorrhage set in.

This new eruption occurring in the absence of pregnancy was checked promptly by the injection of male hormone (10 mgm. daily). After the second day the fever and rash diminished considerably, and after the fourth injection all symptoms had disappeared.

The authors consider the herpes of gestation as a special case of dermatitis herpetiformis (Duhring) and believe that it is caused by sensitization of the skin to estrogenic hormone. The sudden explosive outbreak, the eosinophilia of the blood and tissues, the ever increasing violence of the symptoms with each following pregnancy give evidence of the allergic character of the condition.

It is known that other allergic conditions like certain types of eczema, asthma, Quincke edema, and migraine are often in close relationship with the menstrual cycle and can be treated successfully with hormones which counteract the effect of folliculin (progesterone or testosterone). It has been demonstrated that folliculin continues to be secreted during pregnancy but it loses its effect because of the prevailing action of progesterone. After the third month of gestation, the luteinic hormone is replaced by the ever increasing folliculin produced by the ovary and the placenta. After delivery and expulsion of the placenta, this process is again reversed, and the hyperfolliculinemia is succeeded by a second luteinic phase in connection with the corpus luteum of lactation which inhibits the normal menstrual cycle. The foregoing explains why herpes gestationis never occurs in the first trimester of pregnancy i.e., during

the time that the organism is under the influence of progesterone. The onset of the attack coincides with the cessation of corpus luteum activity and the reappearance of folliculin. Therefore, it seems logical to assume that the disease is an example of hypersensitivity to folliculin, which is produced in excess during pregnancy. This theory is supported by the striking success of treatment with male hormone.

WERNER M. SOLMITZ, M.D.

Ramos, A. P.: Abdominal Drainage in Cesarean Section for Contaminated Cases. (El drenaje abdominal en la operación cesárea del caso impuro). *Obst. gín. lat-amer.* 946 4 7 5

The author believes that low extraperitoneal cesarean section is one solution to the problem of delivery in contaminated cases. He reports a mortality rate of 3.49 per cent and a morbidity of 23.7 per cent for 439 cases. In 188 cases in which sulfonamide therapy was employed the mortality dropped a little (2.13 per cent) whereas the morbidity remained about the same.

Penicillin is looked upon as a still more marvelous agent, and the synergistic action of the two drugs gives greater promise, but it is believed they should be used complementarily to surgery.

In regard to the use of drains in extraperitoneal cesarean section the author believes, as Sterling Mueller, that the tendency of not employing effective drainage of the peritoneal cavity because sulfonamide has been applied is to be lamented and that the old rule "When in doubt drain it" is as valid as it was before the use of sulfonamide therapy.

The classifications of Winter and Bureau both present three groups of contaminated cases which might come to surgery: (1) those in which contamination is suspected because they have been handled vaginally without consideration for asepsis; (2) the infected cases with a temperature of 38° C. and (3) those which have been repeatedly examined externally or without care of asepsis with high fever and contaminated amniotic fluid.

It is in these last two types that drainage complemented with antibiotic therapy is particularly recommended as definitive treatment.

STEPHEN A. ZIEGLER, M.D.

LABOR AND ITS COMPLICATIONS

Baena, A.: Cesarean Section. *Philippine J. Surg.* 1946, 7 5

Before the time of Pasteur and Lister a cesarean operation almost always brought death. The author states that now with asepsis and antiseptics, improved technique, and the exercise of good obstetric judgment, the operation is attended by a very low maternal mortality. The safety of the operation has been so definitely demonstrated that many abuses have been committed in its name. In many cities of the United States the incidence of cesarean section varies from 2 to 3 per cent. To cut down this incidence many hospitals are now passing rules making

it mandatory to hold a consultation before a cesarean section is performed.

Material is presented concerning 228 consecutive cesarean operations which the author performed in the Philippines. The incidence of cesarean section in the Philippine General Hospital from 1927 to 1940 was 0.77 per cent (364 cases among 48,481 births). Ten years earlier it was 0.31 per cent. The incidence among the author's private patients was 1.35 per cent. This higher incidence was due to quite a number of elderly primiparas. Among those between 35 and 40 years of age there were 35 cases, and among those between 40 and 45 years of age there were 5 cases. There is greater rigidity of the cervix and less luxation of the pelvic joints in elderly primiparas.

The classical section was employed in 30 of the 228 cases. When conditions demanded quick operation and if the case was judged to be clean, classical section was used. The classical approach is replaced more and more by low section which has more proved advantages: namely, it offers a smoother postoperative course, better chances of combating infection should it develop, a lower mortality rate and a scar which resists rupture in subsequent pregnancies and labors 16 times more readily than the scar following classical section.

The radical section was employed in 5 of the cases and was chosen because of frank infection and of ablatio placenta with very advanced intramural hemorrhage in which the uterus loses its power of contraction and therefore requires amputation after it has been emptied of its content.

Vaginal cesarean section was employed only once in this series in a case with a dead fetus in utero. The author has performed vaginal hysterotomy many times for removal of the fetus more than 3 months old and for hydatidiform mole demanding fast evacuation through an unyielding cervix. Waters' technique of extraperitoneal cesarean section was attempted in 1 case of placenta previa that was potentially infected. It did not succeed because of a poorly formed lower segment. The operation was continued as a transperitoneal low cervical section and the patient survived.

The indications for cesarean section in puerperia are presented. Placenta previa comprises 40.3 per cent of the indications for section. With only 2 or 3 cm. of the cervix open and rigid, and with no signs of actual infection, cesarean section is the best means of preventing future blood loss. Further separation of the placenta with more stretching of the lower segment of the uterus is inevitable unless treatment intervenes. Two schools of thought exist for the treatment of ablatio placenta. The conservative form of treatment, even in case of concealed hemorrhage, has a mortality of 2.9 per cent. The radical school advocates cesarean section as the better mode of delivery. The mortality rate in this group was 14.3 per cent.

The author discusses the circumstances of rigidity of the cervix, cephalopelvic disproportion, tumor previa, and the repeat section. In this series there

were 2 maternal deaths reported, 1 death occurring in a case of antepartum eclampsia. The fetal loss totaled 31. There were 9 stillbirths and 22 neonatal deaths. If a correction is allowed for the death due to eclampsia, the corrected mortality rate would be 0.49 per cent for the low section. Several of the cases of low section were poor risks against infection. The results, despite the big risks, confirm the claim that low section takes good care of infection. Under low section the postoperative course is seldom stormy.

HERBERT F. THURSTON, M.D.

Benoliel, W.: The Relief of Labor Pain with Continuous Caudal Anesthesia (Il parto indolore con l'anestesia caudale continua). *Riv ostet gin.* 1946 1: 53.

The author's study of 30 cases of labor with the use of continuous caudal anesthesia by means of the American method of administration revealed that 73 per cent of the patients had complete anesthesia while the remainder had partial anesthesia. No ill effects were observed in the newborn, and complications in the mother were rare. No major changes in pulse, blood pressure, and respiration were noted. The maximum drop in blood pressure was 12 mm. Hg (in only 3 cases) while the maximum increase in pulse was 26 and the maximum increase in the respiratory rate was 10.

In 10 per cent of the cases the author observed pallor, dryness of the mouth, excessive pulsation of the temple vessels, and nausea and vomiting. There were no mortalities.

The author concludes that although this form of anesthesia is not perfect, it is worthy of use.

ARTHUR F. CIPOLLA, M.D.

PURPERIUM AND ITS COMPLICATIONS

Wolfa, S. A., and Podowitz, P.: Late Postpartum Hemorrhage. *Am J Obst* 1947 53: 84.

Late postpartum hemorrhage indicates prolonged or excessive uterine bleeding beginning after the first day of delivery. Retention of the placental fragments is the most frequent cause of this condition. Retained fragments may be expelled spontaneously. More commonly however recurrent episodes of bleeding require surgical intervention. The formation of placental polyps is infrequent. Bleeding may be produced by noninvolution of the placental site as evidenced by poorly thrombosed veins which later reopen and cause bleeding. Retention of abnormal amounts of decidua vera during separation of the placenta and membranes may cause the milder form of late postpartum bleeding.

Because of the frequency of retained placental tissue as the cause of this bleeding the authors believe that the first step in management of this problem is digital exploration of the uterine cavity. Only by this method can a retained placental fragment be discovered and removed. If none is present, noninvolution of the placental site or separation of excessive amounts of decidua slough is the causative

factor of the bleeding. If separation of the retained placental fragment cannot be accomplished with the finger, the use of the curette or ovum forceps is safe. Such operative intervention for active bleeding in febrile cases is followed by moderate morbidity.

JOHN R. WOLFF, M.D.

NEWBORN

Tortora, M.: Biological Aspects of the Vaginal Secretion during the Genital Crises of the Newborn (Aspetti biologici del secreto vaginale durante la crisi genitale delle neonate). *Arch ostet gin* 1946 51: 290.

A study of the vaginal secretion of 30 babies within the first 2 weeks of extruterine life revealed a high vaginal acidity, a flora in which the *Doederlein bacillus* was present, an increase of leucocytes and an increase of the cells in the stratum spinosum.

In the first 12 to 14 hours after birth, the vagina of the newborn is free from bacteria. However about the second or third day the vaginal flora contains mainly streptococci and staphylococci. From the third to the seventh day the *Doederlein bacillus* is prevalent, after which the streptococci and staphylococci again are present in quantities.

With Papanicolaou's technique of staining there was found a desquamation of the vaginal and uterine epithelium on account of the cessation of the maternal follicular hormone in the crises. As a rule, hemorrhage accompanies this stage as it is caused by the degeneration and elimination of the cervical mucosa which participates more intensely than the endometrium in this regressive phenomenon.

ARTHUR F. CIPOLLA, M.D.

Laffont, A., and Bonafos, M.: The Influence of Sulfonamide Therapy in the Mother on the Infant (Influence sur l'enfant de la sulfamidotherapie maternelle). *Gyn obst Par.* 1946 45: 447.

The widespread use of sulfonamide therapy both prophylactically and therapeutically in obstetrical practice is well known. The authors have studied the effects on the newborn of such therapy instituted in the mother antepartum and postpartum during the nursing period.

In their studies on sulfonamide therapy in the pregnant woman, the authors concurred with many others that there was a transplacental passage of sulfonamides, which has been proved by animal experimentation. They determined that the blood level of sulfonamide was the same in the mother and fetus from 3 to 5 hours after injection; furthermore, this level was proved to be sufficient to protect the infant from any disease of the mother either blood borne or contracted at the time of parturition (puerperal sepsis or gonorrhea). Although authorities generally agree that sulfonamide therapy in the mother has no ill effect on the fetus, yet the possibility of idiosyncrasy to the drug and the possible effects when the drug is given over a long time demand caution against indiscriminate usage.

The authors cite 130 cases in which sulfonamides were administered to pregnant women. 50 per cent of these cases were followed by miscarriages, premature fetal death, premature labor, icterus of the newborn, or congenital anomalies. The authors, however, do not implicate the sulfonamides as the causative factor in fetal death and debility but, rather, the mother's disease for which the sulfa drugs were given (pneumonia, gonorrhea, pyelonephritis, osteomyelitis). The incidence of icterus of the newborn in statistics compiled before the days of sulfonamide therapy is no less than that reported by the authors in their series.

There were 18 neonatal deaths in the authors' series of these, 11 demonstrated what the authors call sulfonamide syncope of the newborn, a condition which they charge to sulfonamide toxicity. The clinical picture in the newborn is that of livid pallor, prolonged apnea, and generalized hypotonia from which the authors conclude that the sulfonamides exert a toxic effect in a few cases on the nervous system, heart, lungs, liver and hematopoietic tissue of the fetus. However, this effect fortunately does not compromise the future of the infant, except rarely. These exceptions can be explained by a predisposition of the infant to prolonged antenatal administration of the sulfonamides begun late in pregnancy. It is important to note that sulfonamide therapy, even when massive and prolonged, is not accompanied by any fetal damage if it is instituted early rather than late in pregnancy. But, in spite of this occasional idiosyncrasy of the fetus to sulfonamides, the authors agree that in the clearing of certain maternal infections by sulfonamides, the prognosis for a normal healthy infant is much better and the percentages of premature labor so high in acute infections, are much reduced. Also the chance of spread of maternal infection by the blood stream to the fetus is avoided, and the chance of an almost certain intrauterine death of the fetus in an amniotic fluid is obviated.

With regard to the effect of maternal sulfonamide therapy on the nursing infant, the authors first demonstrated the presence of sulfonamides in the milk, then evaluated the quantity absorbed by the infant and the level of the drug therapeutically effective in the newborn. They found that the drug appeared in the milk from 3 to 6 hours after absorption of the first dose and persisted during the course of treatment up to several hours after its discontinuance. The level in the milk is generally 65 per cent, the same as in the maternal blood stream. The amount of drug absorbed by the infant is far below the therapeutically effective level (about one-tenth) for an infant, but the authors believe that from the point of view of prophylaxis, particularly if the mother has an infectious disease, this level is sufficient and in some cases is of definite advantage to the infant. Thus, the benefits to the fetus of sulfonamides administered to the mother antepartum in preventing infectious processes may be continued by allowing the infant to nurse from the mother who

is still receiving the drug. A normal nursing infant of 9 months theoretically would absorb from 10 to 15 mgm. of sulfa drugs in a day.

The authors find, however, that sulfonamides exert a definite inhibiting influence on the secretion of milk. This inhibition is observed particularly in primiparas. Of 15 cases reported by the authors, 12 showed definite hyposecretion of milk. Twenty nine out of 34 multiparas who had previously nursed infants and received sulfonamides both antepartum and postpartum were unable to satisfy the nutritive needs of their offspring. It was also found that if a nursing mother was given sulfonamides for some reason anywhere from 1 to 9 months after delivery her supply of milk definitely diminished even the public is aware that sulfonamides help to dry up secretions of milk.

The infant who receives sulfonamides in the mother's milk may occasionally show digestive, circulatory, respiratory or nervous difficulties. In some cases the infant refuses to take sulfonamide milk but will greedily take artificial feeding. Vomiting, diarrhea, and colic have been observed to coincide with sulfonamide therapy in the mother. Pale-ness and cyanosis together with irregularity of pulse and subnormal temperature have also been observed rarely there is an alarming apnea, abnormal respiratory pauses, and panting respiration. Nervous complications include hypotonia, and occasionally convulsions. Anemia is sometimes seen. All of these reactions were noted much more frequently in nursing infants whose mothers began taking sulfonamides after confinement.

Although the dose of active principle taken in by the nursing child is atomic, many factors enter into an exact interpretation of the chemotherapeutic index; this also is true in the question of idiosyncrasy in which low levels may be just as significant as therapeutic levels.

PHILIP B. CHASE, M.D.

MISCELLANEOUS

Zambonini, A.: Anomalies of the Umbilical Cord (Le anomalie del cordone ombelicale). *Riv. Ital. St.* 945, 3, 60.

Anomalies of the umbilical cord are common and are not only of anatomical and teratological interest, but when they interfere with function, they become of considerable clinical interest.

Anomalies of purely anatomical interest are the absence of one umbilical artery, the presence of supernumerary arteries or veins, bifurcation of the umbilical vein, cases of divided placenta in single births, and multiple cords, each of which carry an artery and vein.

The more important anomalies of the umbilical cord are those which are capable of causing a sphryxia or other injury to the fetus. The author discusses these at length and then gives a statistical report of the corresponding anomalies which occurred in 3,043 of 10,440 umbilical cords, (18.75%) in 10,295 deliveries at the Obstetrical and Gynecological Clinic at

Bologna from 1939 to 1943. Of these 10 295 deliveries, 145 were deliveries of twins.

In 1862 of the 2 034 cases presenting abnormality of the umbilical cord there was spontaneous delivery with no injury to the fetus in 140 cases the fetus suffered on account of the abnormality of the cord and in 41 cases death resulted.

Hematoma of the umbilical cord results from laceration of the vessels of the cord and the consequent flow of blood collects beneath the amniotic sheath. Hemorrhage is more often venous than arterial, but it can occur in any of the 3 umbilical vessels. Severe hemorrhage is comparatively uncommon.

Torsion of the umbilical cord results from movements of the fetus. The torsion is usually of mild degree and causes no harm to the fetus but it may be severe enough to shut off the umbilical circulation completely and cause asphyxia of the fetus.

False knots of the cord may result from such conditions as varicosities of the umbilical vessels or from accumulations of Wharton's jelly. These conditions rarely interfere with the maternal-fetal circulation.

Brevity of the umbilical cord may be a harmful anomaly when great enough tension is exerted on the short cord to interfere with the umbilical circulation. In the series of deliveries presented in this article, there were 45 cases of brevity of the cord, 36 of which terminated in spontaneous delivery and 9 resulted in pathological conditions with death of the fetus in 2.

Excessive length of the cord is a more common anomaly than brevity of the cord. Of itself it is not

dangerous, but when the cord becomes prolapsed or wound tightly around parts of the fetal body it may produce serious harm.

Coils of the umbilical cord around different parts of the fetus e.g. the neck, thorax, abdomen, or limbs, is a very serious complication of pregnancy. Multiple coils about the same part of the body often occur. In 1 185 cases of coils of the umbilical cord about the fetus which occurred in this series, delivery was spontaneous in 1 058 and caused pathological conditions in 127 with death of the fetus in 11.

Procentia of the cord is rare only 7 cases occurring in this series. In 6 of these delivery was spontaneous. In 1 case the fetus was dead, complete asphyxia having resulted from the procentia.

Prolapse of the umbilical cord is a very serious abnormality. Of 43 cases occurring in the series presented, 18 ended in spontaneous delivery and in 25 cases the delivery was pathological, with death in 19 fetuses.

True knots occur in cases in which the umbilical cord is of excessive length when there is excessive amniotic fluid when there are especially active movements of the fetus, and at times when the mother executes sudden and forceful movements. Of 57 cases of true knots of the umbilical cord presented in this series, 47 terminated in spontaneous delivery, while in 10 cases delivery was pathological. In 6 cases the fetus was dead.

This research into the anomalies of the umbilical cord demonstrates what an important part serious anomalies play in the life of the fetus.

BLACKWELL MARSHAM, M.D.

GENITOURINARY SURGERY

ADRENAL, KIDNEY AND URETER

Johnson H. T., and Nesbit, R. M.: 17 Ketosteroids in the Diagnosis of Adrenal Tumors. *Surgery* 1947 31: 184

Clinical syndromes involving masculinizing symptoms have long been recognized. Thomas Cook, in 1765 being the first to describe a child with changes probably due to excess androgens. Before 1933 there was great confusion over the etiologic factors involved in these syndromes. Suggested causative agents included adrenal tumors, ovarian tumors, thymic tumors and other vague endocrine disorders.

Ballock and Sequeira, in 1905 published a series of 11 cases of masculinization in women caused by adrenocortical lesions, and in 1913 Gallus introduced the term "adrenogenital syndrome."

In 1932 Cushing recorded a number of cases of masculinization in which basophil adenomas of the anterior lobe of the pituitary gland had been demonstrated.

Frequently no definite lesion of the endocrine glands is demonstrable, but the adrenal glands are usually enlarged and may contain small adenomas, which Cushing regarded as secondary. That a very similar syndrome may be caused by tumor or hyperplasia of the adrenal cortex also has been definitely established, and in these cases there is an excessive amount of 17 ketosteroids demonstrable in the urine. At present it is thought that both pituitary and adrenal mechanisms may be involved but there is no general agreement as to which is primary.

The differential diagnosis of the etiologic factors in these syndromes on clinical grounds alone is difficult. Roentgenograms of the skull, pentacel air insufflation, or pyelograms may be very helpful, and a tumor of the adrenal or ovary at times may be palpable. The recent evidence brought forth by Crooke and Callow that the adrenocortical tumor group may be differentiated by estimation of the greatly increased urinary androgens in these cases, thus becomes of great significance.

Estimation of the total 17 ketosteroids may therefore be of great value in differentiating adrenocortical lesions from pituitary, ovarian, and other disorders, but it does not distinguish adrenocortical hyperplasia from adrenocortical carcinoma, both of which have excessive androgen production. However it has been shown that the total 17 ketosteroid output can be separated into alpha and beta fractions, and there is evidence that whereas the alpha ketosteroids are produced by both the adrenals and testes the beta ketosteroids arise only from the adrenal cortex.

A survey of the literature reveals less than 35 cases of adrenocortical tumor in which the total 17 ketosteroid output has been determined and fractionation into alpha and beta portions has been performed in

only a very few. Three proved cases of adrenocortical carcinoma associated with markedly elevated total 17 ketosteroid excretion, in which fractionation into alpha and beta portions has been of definite value in the differential diagnosis are reported.

JOHN E. KIRKPATRICK, M.D.

Dodson, A. I.: Polycystic Disease of the Kidney. *J Urol* Balt. 94: 57 309.

In polycystic disease of the kidney the destruction of renal tissue results from pressure exerted by the gradual increase in size of the congenital cysts interspersed throughout the kidney. Most patients are beyond 30 years of age before the disease is recognized. Consequently it seems logical to operate on these patients as soon as the disease is recognized, excise a portion of the wall of the superficial cysts, and aspirate as many as possible of those which are deeply situated. From a review of the literature, it seems that most authors consider the treatment largely medical and prefer to resort to surgery only when there is obstruction, stone infection, severe hemorrhage or incapacitating pain. The principal objections to conservative operations in the treatment of polycystic kidneys are that fistula may result, infection may spread to the rest of the kidney and the results are very uncertain.

The author has followed the conservative plan in the past but reports 3 cases recently treated which cause him to question his former conservatism.

The first patient, a 36 year old female, had a history of attacks of kidney colic, often with fever for a 20 year period. Phenolsulfonphthalein elimination was 35 per cent in 1 hour. Both kidneys were infected with the *Escherichia coli*. Pyelograms showed only the characteristic changes of polycystic disease. Operation was done on each kidney; the cysts were opened and drained of purulent material, and in the course of about 6 weeks the patient was discharged with much improvement in her condition. Two months after operation the phenolsulfonphthalein excretion was 55 per cent, the pyelograms showed improvement, and the patient's general condition was better. She was seen at the end of 11 months when she was entirely symptom free.

The second patient, a 64 year old female, had had pain in the right lumbar area for 12 months. Pyelography demonstrated bilateral polycystic disease. Operation was performed on the right kidney with satisfactory recovery. With the exception of one episode of mild pyelitis on the right side, the patient has been asymptomatic for the 3 years that she has been followed up since surgery was done.

The author concludes that inasmuch as medical treatment has little to offer these patients and the course is always downhill more consideration should be given to surgical relief for the patient with this disease.

JOHN E. M. CRILL, M.D.

Kojen L. and Petkovic, S : Urinary Lithiasis following Osseous Wounds of War (La lithiase urinaire consécutive aux blessures osseuses de guerre) *Rev chir.*, Par 1947 66 14.

In an army urologic center the authors encountered 17 patients with war wounds of the skeletal or osseous system and urinary lithiasis. In 9 cases there was no associated wound of the urinary tract and the urine was sterile. Eight patients had in addition to their bone injury an injury of the ureter or bladder and infected urine.

While this is a relatively low incidence of urinary lithiasis when one considers the large number of bone injuries sustained in the war the authors have reached certain conclusions as to the relation between these injuries and the development of lithiasis.

In the etiology of post traumatic urinary lithiasis the following factors are significant.

1. The bony decalcification which is followed by hypercalcemia and hypercalciuria.
2. The immobilization necessary which favors decalcification of the entire osseous system.
3. Alterations in the kidney resulting from a greater elimination of lime salts.
4. Alterations in the kidney produced by microbes and toxins from the site of fracture.
5. Stasis resulting from prolonged rest and immobilization in a horizontal position.
6. Suppuration at the fracture site which creates favorable conditions for formation of urinary calculi.
7. The appearance of lithiasis more frequently after compound fractures of the femur.

The treatment of urinary lithiasis associated with fractures or bone wounds involves proper surgical care of the fracture site, adequate fluid therapy and early motion. Once lithiasis has occurred the treatment should be conservative. The stones are often small and will pass through the urinary tract spontaneously. If the stones will not pass spontaneously the authors recommend that the fracture site be immobilized adequately to permit the patient's transfer to a mineral spa and later return for operation. Patients should not be operated upon while their condition is favorable for the formation of urinary calculi.

EDWARD W. GIBBS, M.D.

BLADDER, URETHRA, AND PENIS

Prather G. C. and Petroff B. Bladder Neck and Spinal Cord Injuries. *J Urol* Balt. 1947 57 374.

A series of 129 cases of spinal cord injury, representing material accumulated in army general hospitals designated as centers for the care of such injuries was studied for evidence of changes in the bladder neck and posterior urethra. The anatomic changes were recorded by means of retrograde injections from the external meatus, of small amounts (from 25 to 30 c.c.) of radiopaque media with subsequent roentgenograms.

The authors' findings indicate that it is important to differentiate between partial and complete tran-

section of the spinal cord. The cases designated as those with partial transection show some evidence of voluntary motor power and sensory appreciation below the level of the lesion. Cases with complete transection show complete functional interruption of the spinal cord at a given level.

Dilatation of the bladder neck was the most important finding in this series. Here, in complete transection of the spinal cord *en cauda equina* the time element was an important factor. A greater number of dilated bladder necks were found 3 to 12 months after injury than 2 to 3 months after the accident. However, the period of time elapsing from the time of injury to the time when these studies were undertaken did not appear to be so important in cases of partial transection.

In complete transection of the cord *en cauda equina*, the bladder neck revealed some degree of dilatation in 30 of 36 cases, a ratio of 5 dilated to 1 normal. In partial transection 65 of 93 showed some dilatation, a ratio of 2 dilated to 1 normal.

A study correlating the level of injury with the presence of bladder neck changes indicated that dilatation of the bladder neck is predominant but not constant in cases with complete transection of the spinal cord and that dilatation is always present in complete transection of the *cauda equina*. In those with partial transection dilatation of the bladder neck is common and occurs with increasing frequency from the level of the cervical region to the *cauda equina*. The prevalence of dilatation was not affected by the bladder capacity, i.e. whether it was hypertonic or hypotonic.

The authors conclude that dilatation of the bladder neck is a common finding in patients with injury of the spinal cord.

CLARENCE V. HODGES, M.D.

De Souza Carvalho Netto J. N. A Study of Freyer's Operation Adenomatous Hyperplasia Drainage According to the Author's Method (Estudo atual da operação de Freyer. Hiperplasia adenomatosa com drenagem suficiente, pelo autor) *Rev. Brasil. Cir.*, 1946 15 411.

A great variety of conditions have been made responsible for so-called hypertrophy of the prostatic gland, e.g. syphilis, rheumatism, arthritis, gout, alcoholism, sexual abuses, a sedentary mode of life, habitual constipation, urethral strictures, cystitis, and calculi of the urinary bladder. However, all such conditions may be considered only as contributory factors. Hereditary factors and allergic conditions have also been mentioned in the literature. Neoplastic and infectious theories also find their defenders, while some writers consider hypertrophy of the prostate gland as a compensatory process for which changes in the testes are responsible.

The author focused his attention on rudimentary prostate glands which may be divided into two groups: subcervical and those of the trigonum.

Prostatic hypertrophy is not a diffuse hyperplasia of the entire structure but of separate foci, mainly a

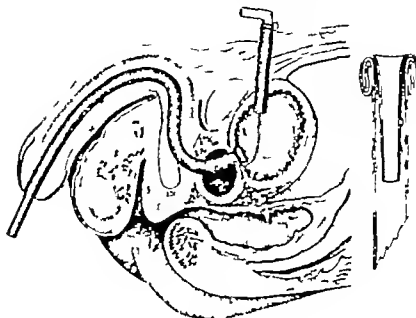


Fig. (DeSouza Carnalho Net)

hypertrophy of the centrally located glands. Four types of hyperplasia may be distinguished glandular which is the most frequent on cystic fibro-glandular, and fibrous.

According to the members of the Cleveland Clinic, testes produce masculine and feminine sex hormones. An excessive secretion of the masculine hormone under the influence of stimulation by the hypophysis leads to an adenomatous hypertrophy of the prostatic urethra. The Amsterdam school is diametrically opposed to this theory maintaining that an excess of estrogens or other gonadotropic substances is the responsible factor and that therefore androgens should be administered to re-establish the normal equilibrium.

The author concludes from his studies that the term "hypertrophy of prostatic gland" should be replaced by "adenomatous hyperplasia of the prostatic urethra." Consequently prostatectomy should be replaced by adenectomy. The author describes the technique of suprapubic prostatectomy which he terms transvesical paraprostatic adenectomy. He considers proper drainage as the most important factor in the operative technique. To prevent contamination by the urine of the cavity created by removal of the glands, he employs a catheter with its proximal end so invaginated that 2 tubes are created the inner one drains the fluid from the bladder while the outer which carries several rows of holes, drains the secretions from the cavity underneath the bladder. The sphincter of the bladder fits around the tube just below its invaginated portion so that the bladder and the cavity below it do not communicate one with the other. The proximal end of this drain is attached with a string to the distal end of another

drain introduced through the cystostomy. A traction on the last mentioned drain disposes of the cuff on the lower drain, to facilitate its removal.

JOSEPH E. NARBY M.D.

Woodard H. O. and Dean, A. L.: Phosphatase Findings in Carcinoma of Prostate. *J. Urol.* Balt. 94: 57, 18.

Phosphatase is an enzyme which splits the phosphate radical from organic phosphorus compounds. Phosphatases occur in many tissues and differ in properties with their tissue of origin. They fall into two broad groups—those with a maximum activity in alkaline solution and those with a maximum activity in acid solution—and are known respectively as alkaline and acid phosphatases. In addition to differing in pH optimum phosphatases differ in their relative activities on various substrates.

Alkaline phosphatase. Bone and ossifying cartilage contain an enzyme which splits calcium glycerophosphate and calcium hexose monophosphate in alkaline solution. Alkaline phosphatases are abundant in bone, kidney and testicular mucosa. Normal values for serum alkaline phosphatase are given as 5 to 10 Bodansky units per 100 c.c. The major portion of the alkaline phosphatase in the blood serum originates in the bones and is rapidly excreted by the liver. When the bile ducts are obstructed alkaline phosphatase is not excreted and accumulates in the blood serum. Serum alkaline phosphatase cannot be used as a test of bone activity in patients with marked liver disease. Alkaline phosphatase is produced by bone as an essential agent in growth and repair. It is produced in large amounts wherever new bone is being formed or an attempt at new bone

formation is being made. The level of alkaline phosphatase in the serum usually reflects bone activity rather closely when liver function is normal. When cancer of soft part origin metastasizes to bone, and the lesions are osteoplastic alkaline phosphatase production is increased. Bone metastases from carcinoma of the breast, thyroid and kidney are usually osteolytic, while prostate carcinoma metastases are nearly always osteoplastic. In the former the serum alkaline phosphatase is commonly within the normal range in carcinoma of the prostate metastatic to bone it begins to rise early in the disease and may increase as much as 50-fold. It is emphasized that new bone formation is the result of excess alkaline phosphatase production rather than the cause of it.

Acid phosphatase. Prostate extracts and prostatic secretion contain an acid phosphatase which splits phenylphosphate alpha and beta glycerophosphate and hexose diphosphate. In man the activity of the prostate is 100 or more times as great as that of any other tissue. Cancer of the prostate retains the ability to produce large amounts of acid phosphatase which is characteristic of the normal adult prostate and distant metastases share this ability with the primary tumor whether the metastases are in bone or in soft parts. In metastatic areas in bone the acid phosphatase is produced by the tumor in the bone the alkaline phosphatase is produced by the bone around the tumor.

In Woodard's method sodium beta glycerophosphate is used as a substrate at a pH of 4.2 to 5.0 and normal values do not exceed 10 units per 100 c.c. and are independent of alkaline phosphatase readings. Because serum acid phosphatase is elevated in some patients with metastasizing carcinoma of the prostate the test is a valuable aid in diagnosing prostatic cancer and in evaluating the effect of treatment. The liver does not play a part in controlling the acid phosphatase of serum.

Of the patients with carcinoma of the prostate metastatic to bone 75 per cent in the authors series had elevated serum acid phosphatase readings when first seen. Nearly all (89%) had elevated serum alkaline readings as is to be expected from the almost universal osteoplastic character of the bone lesions secondary to prostatic cancer.

It sometimes happens that a patient with a normal or slightly elevated serum acid phosphatase has a tumor involving the prostate but ulcerating into the bladder or rectum, so that it is not possible by physical examination to determine the origin of the lesion. In such cases it may be possible to show whether the tumor does or does not originate in the prostate by measuring the acid phosphatase activity of extracts of tissue removed through the proctoscope or pan-endoscope. This possibility arises from the fact that the tissue acid phosphatase activities of carcinomas of the rectum or bladder do not exceed 3 units/gm. while that of prostatic carcinoma is usually greater than 100 units/gm.

Patients with carcinoma of the prostate experience prompt and striking clinical improvement following

surgical castration or estrogen therapy but 10 per cent of the carcinomas are completely refractory. When serum acid phosphatase is initially elevated it usually exhibits a marked drop within a week after surgical castration or within 2 to 3 weeks after the beginning of estrogen therapy. The alkaline phosphatase usually rises within a month after surgical castration occasionally after the beginning of estrogen therapy and when the clinical response is favorable the serum alkaline phosphatase falls again after 3 to 4 months. If clinical improvement is not maintained the alkaline phosphatase remains at high levels. After 4 to 6 months the serum alkaline phosphatase in castrated patients begins to reflect the clinical course rather closely. A similar response is seen much less frequently during the first few months of stilbestrol treatment.

DAVID ROSENBLUM, M.D.

Somalo M. Varicocele Due to Vascular Reflux; Operation of Ivanissevich; Origin Technical Derelopment and Present Status (Varicocele por reflujo operación de Ivanissevich. Origen Desarrollo técnico Estado actual) *Sem med B Air* 1946 53 948

In 1918 Ivanissevich advanced his conception of the common form of varicocele as the result of a venous reflux from the spermatic veins. When the blood in the veins is subjected to the intra-abdominal pressure it may overcome the resistance of the venous valvular structures and actually reverse its direction, passing down through the anterior bundle of veins (pampiniform plexus) which is contained within the fibrous tunic of the cord, into the tail of the epididymis. Here anastomoses pass to the posterior bundle which lies outside of the fibrous tunic of the cord. From this posterior bundle of the pampiniform plexus the blood runs off through the funicular and parietal systems of veins where the weight of the abdominal pressure is less noticeable. This is the order in which the varices develop and Ivanissevich has demonstrated this actual reflux in his early operations by cutting the spermatic vein at the internal inguinal ring under local anesthesia and having the patient bear down with his abdominal pressure, when the blood wells normally from the distal cut end but spurts across the operating room from the proximal end of the vein.

It was not until 1922 however, that he brought out his sign for distinguishing the reflux type of varicosities of the scrotum. With the patient lying down, the varicocele was milked back toward the abdomen and the venous supply therefrom pinched off at the base of the scrotum. The varicosities would remain empty even with the patient upright until the pressure at the base of the scrotum was removed. This is Ivanissevich's sign. Therefore, he taught and demonstrated that it is necessary only in the common type of varicocele to cut and tie off the spermatic vein or veins up high at the internal inguinal ring to effect a cure. At first the incision was made low over the inguinal canal and the in-

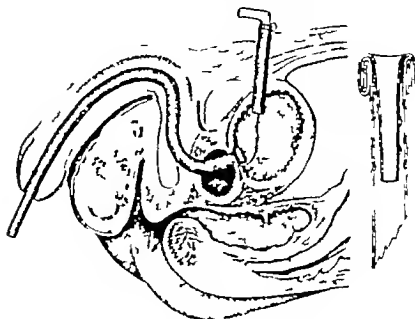


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JOSÉ PI R. VABAT M.D.

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guinal canal itself opened to ligate the vein at the internal ring. Later (about 1918) however the incision was placed higher and farther out beyond the inguinal canal and the vein sought, after the fascial and muscular coverings were cut through at a point further along before it became entangled with the other elements of the cord. This change in technique was not especially emphasized at the time and is one of the elements which has led to so much confusion about the Ivanisevich operation. However the basic concepts of the original Ivanisevich procedure have remained unchanged and any operation based on these concepts is merely a modification of the Ivanisevich operation.

Somalo's modification of the Ivanisevich operation consists merely in the location and character of the incision and the point at which the spermatic vein is reached. This point is on a transverse line drawn from the under side of the anterosuperior spine of the ilium, 6 cm. medially and about 3 cm. above Poupart's ligament. The skin is incised transversely over this point down to the fascial and muscular layers of the abdomen, which are then opened along the direction of the muscle fibers as in the McBurney gridiron incision. The spermatic vein can thus be reached in the space of Bogros beyond the point where the vessel was attained in the second operation of Ivanisevich.

JOHN W. BROWN, M.D.

Goodwin, W. E., and Vermooten, V.: Multiple Fibromas of Tunica Vaginalis Testis or a Proliferative Type of Chronic Periorchitis; A Report of 2 Cases. *J. Urol. Balt.*, 1946, 56, 439.

Two cases exhibiting multiple fibromas of the tunica vaginalis testis are reported in considerable detail. Both patients were white soldiers, 33 and 39 years of age. In the first patient the condition was discovered at the time of a routine examination and in the second patient it constituted the principal complaint. It is interesting to note that both patients presented some signs suggestive of arthritis.

The younger patient's tumor was found to originate from the tunica vaginalis and was distinctly separate from the epididymis. This was later confirmed by histological examination, which showed also some areas of calcification in the tumor. The second patient's tumor though originating from the tunica vaginalis, was intimately associated with the epididymis.

Histologically the significant picture of this grossly nodular mass is that of nodular fibrosis consisting of collagen without a distinct inflammatory reaction. The periphery shows a well developed capsule.

The paper embodies extremely good illustrations of both the gross specimens and cytological studies of the tumors.

ROBERT LACE, JR., M.D.

Da Fonseca, V. L.: Testicular Tumors (Tumores do testículo). *Arch. Brasil. Med.* 1946, 56, 375.

A case of seminoma of 6 months' duration in a 46 year old man is reported by the author who states

that according to the literature, neoplasms of the testes form 0.38 per cent of the total number of tumors occurring in the human body.

Traumas, syphilis, tuberculosis, heredity and sexual activity have been accused as etiologic factors. Of the various classifications the author chooses the simplest and the most practical one. This classification divides all testicular tumors into two groups: seminomas and teratomas. The propagation of metastases takes place chiefly through lymphatic paths, although mixed tumors may spread also through the blood vessels to form secondary tumors, chiefly in the lungs. Gynecomastia, frequently observed in patients with testicular tumors, has been attributed by various authors to atrophy of the specific testicular tissue, hyperfunction of the hypophysis, secretion by the neoplastic tissue of a hormone which is directly responsible for enlargement of the breasts, or finally to secretion by the tumor of a hormone which stimulates hypophyseal function.

Differential diagnosis must be made from hydrocele, hematocele, tuberculosis and syphilis.

Hormonal reactions are of great diagnostic value because the determination of the amount of gonadotropic hormones allows differentiation of various types of tumors. Such studies may even reveal the presence of metastases because the reactions are positive even after orchiectomy.

As to the treatment the author recommends a radical operation in the form of orchiectomy supplemented by extirpation of the lumbar and aortic lymph glands.

JOSEPH E. VASAT, M.D.

Vermooten, V.: Orchidopexy. *J. Urol.*, Balt. 1947, 57, 30.

Vermooten presents a new modification of the Bryan operation for orchidopexy. In the usual Bryan technique the testis is placed midway or at the upper end of the scrotum. The Torek operation must be done in 3 stages.

Vermooten believes that the scrotum, filled with elastic connective tissue fibers, must be incised from the inside until only skin is encountered, and that when the testis is simply placed against the elastic scrotal fibers the latter act as a hammock and tend to push the testis out of the scrotum. When adequate lengthening of the cord has been obtained at operation the only reason for the testis not to remain at the bottom of the scrotum is the normal hammock-like elasticity of the scrotum. Therefore, after lengthening the cord (dividing the vas deferens in a unilateral case if necessary) Vermooten divides the scrotal elastic fibers with a knife until only skin presents in the wound, and the testis is sutured against this denuded area. The sutures are tied on the outside of the scrotum and the testis is fixed automatically in the most dependent portion of the scrotum. Tension, by means of an elastic band, is then applied to the testis and scrotum by connecting the band to the medial aspect of the opposite thigh. Traction is maintained until the catgut suture sloughs out, usually on the seventh day.

The author believes that the good results of the Torek procedure are due not primarily to the placing of the testis in the thigh but that in this procedure the scrotal elastic fibers are divided

DAVID ROSENBLUM, M.D.

MISCELLANEOUS

Nesbit R. M. and Others: Effects of Blockade of the Autonomic Ganglia on the Bladder *J Urol Balt.* 1947 57 242

Teab (tetra-ethyl ammonium bromide) administered parenterally produces a blockade of the autonomic ganglia in animals and in man. The effects noted in man have been a fall in the arterial pressure, an increase in the heart rate, postural hypotension, an increase in the peripheral skin temperature, ptosis of the upper eyelids, loss of accommodation, dry mouth, decreased gastrointestinal motility, and difficulty in voiding. Further studies were undertaken by the authors to determine the effects of the drug on the urinary bladder and the act of micturition. From a consideration of the normal physiology of micturition it was postulated that the drug would (a) produce a blockade to the motor impulses being transmitted along the pelvic nerve in the region of the parasympathetic ganglia, which would result in impairment or complete absence of the voiding contraction of the bladder, (b) have no effect upon the temperature, the tactile proprioceptive, and pain sensations arising from the bladder, and (c) have no effect upon the ability of the bladder to adapt itself to increasing volumes of fluid at approximately the same intravesical pressure.

After ascertaining the residual urine, 60 c.c. of warm and cold distilled water were instilled into the bladder to determine the presence or absence of temperature sensation. Two cystometrograms were usually obtained for control before 500 mgm. of tetraethyl ammonium bromide were injected intravenously. During the cystometric procedures the patient was asked to indicate the time of first sensation of filling and first desire to void. If the patient did not void around the catheter when the bladder capacity had been attained, the catheter was removed and the patient was given a trial of voiding in the sitting position. Similar cystometrograms were obtained after injection of the drug.

Twelve of 16 normal patients showed a partial or complete response to the drug. A complete response

was arbitrarily designated as one in which the voiding contraction of the detrusor muscle was completely abolished and the patient was unable to void after the catheter was removed. A partial response denoted one in which the patient voided incompletely after injection of the drug and demonstrated a large residual urine, or one in which the bladder capacity was greatly increased. All of the 7 male patients showed a response to the drug, but in only 5 of the 9 female patients could a bladder response be elicited.

In 3 patients with autonomous neurogenic bladders (resulting from destruction of the motor and sensory roots of the spinal reflex arc controlling detrusor contractions) no changes in the cystometrographic findings were noted after administration of tetraethyl ammonium bromide.

In 4 of 5 patients with uninhibited neurogenic bladders (resulting from lesions of the cerebral motor cortex or the corticospinal tracts or from inadequate development of the normal integration of the cerebral inhibitory mechanism controlling voluntary micturition) both the uninhibited and voiding contractions of the detrusor muscle were abolished, and the uninhibited contractions were abolished in the fifth patient. All of the patients showed a tremendous increase in bladder capacity following injection of the drug.

Of 3 patients with reflex neurogenic bladders (resulting from a lesion of the spinal cord involving the afferent tracts carrying impulses to the higher centers, and the efferent tracts carrying inhibitory impulses from the higher centers to the lower motor neurons involved in the micturition spinal reflex arc, the arc itself being intact) 2 showed increased bladder capacities, but none of the 3 was able to void following the administration of tetraethyl ammonium bromide.

Of 3 patients with miscellaneous neurogenic bladder involvement which could not be classified in any of the previously mentioned categories 2 showed a bladder response similar to that seen in the reflex neurogenic bladder group.

Visceral sensation in all of the bladders was totally unaffected by the drug. The ability of the bladder to maintain an approximately constant intravesical pressure with varying volumes of fluid was not abolished by parenteral administration of the tetraethyl ammonium ion.

CLARENCE V. HOGGINS, M.D.

SURGERY OF THE BONES, JOINTS, MUSCLES, TENDONS

CONDITIONS OF THE BONES, JOINTS, MUSCLES, TENDONS, ETC.

Mackenzie W.: Painful, Nonsuppurative, Localized Sclerosis of the Long Bones, with a Report of 2 Cases. *J Bone Surg* 947 29 49.

Sclerosing nonsuppurative osteomyelitis was described by Garré in 1892 before the roentgen ray was available. This condition has received roentgenographic recognition and is described by Gray as a rare form of chronic nonsuppurative osteomyelitis generally affecting either the tibia or femur in older children and young adults, which is characterized by a diffuse area of sclerosis near the end of the diaphysis, gradually fading off into normal bone.

Various writers have reported cases from time to time. In 1940 Jaffe and Lichtenstein described a series of such cases of which 13 involved the shaft cortex of long bones. The patients were adolescents or young adults. The principal complaint was pain, and it was this that consistently led the patients to seek medical attention. In no case was there a history of febrile episodes in connection with the lesion. Local heat and redness were absent.

Jaffe and Lichtenstein drew attention to 3 features in the roentgenographic appearance of these lesions (r) the focus (osteoid osteoma proper) which is generally indicated by an oval, relatively 'clear' area and (s) the surrounding osseous reaction incited in the adjacent bone when cortex of the long bone is involved, which results in very marked cortical thickening, which "may extend for several inches both above and below the osteoid osteoma proper" and may partially envelop the shaft of the bone.

These authors state "It seems very clear to us that a great many cases which have been interpreted specifically as osteomyelitis with annular sequestrum chronic bone abscess, osteomyelitis with cortical-bone abscess, 'sclerosing nonsuppurative osteomyelitis' osteomyelitis chronic from the beginning" etc., actually belong in the category of osteoid osteoma. Surgical treatment resulted in clinical cure "with prompt and often dramatic relief of distressing pain" there were no recurrences in 7 years.

It would appear that nonsuppurative sclerosis of the cortical bone, accompanied by pain, is a clinical and pathological entity for the explanation of which the associated existence of a benign neoplasm, designated "osteoid-osteoma," has been postulated by Jaffe and Lichtenstein, who further claim that the lesion admits of roentgenographic verification.

A completely satisfactory interpretation of the total lesion is not provided by the conception of reactive osteosclerosis in relation to a neoplastic center such as is described by Jaffe and Lichtenstein these authors indeed, admit that "why an osteoid-osteoma should arouse a perifocal osteosclerosis is by no means clear

The author reports 2 cases of painful, nonsuppurative, localized sclerosis of the long bones, one in a girl of about 11 years and the other in a boy of 14.

A special feature of these 2 cases is that the radiolucent area was not sharply outlined, resembling the illustrative roentgenograms of Jaffe and Lichtenstein and of others. On microscopic examination, the bone focus removed in the second case resembled the histological description given by Jaffe and Lichtenstein.

No positive opinion is expressed regarding the essential nature and cause of the bone lesion in the 2 cases.
ROBERT S. RICE, M.D.

De Pablo, J. S. and Caso L. S.: Multiple Exostoses (Las llamadas exostosis múltiples) *Congr. for Locomotor* 946 3 85

Multiple exostoses are known in the literature under a variety of names such as osteogenic disease, osteophytosis, osteochondrophytosis, cartilaginous perostosis and exostosis, osteogenic exostosis, hereditary deforming chondrodysplasia, and multiple osteochondromas. The condition is characterized by the presence of exostoses proximal to epiphyses, enlargement of metaphyses, curvatures of long bones, alterations of articular surfaces, synostoses, and rarefaction of the cancellous bone. It develops during the period of growth and occasionally shows a tendency to malignant degeneration. In some cases, hereditary factors seem to play a rôle.

As to the genesis of the condition, some authors have thought that the condition might be related to rickets, although no clinical or pathologic toxic findings lend support to this theory. Osteoid tissue and deficient calcification characterize rickets, while in exostoses only an irregularity of the ossification line, and/or a premature ossification of the epiphyseal cartilage may be found.

Another theory is that the condition develops as the result of exogenous toxic factors such as phosphorus, arsenic, or lead, or endogenous pathological conditions such as gout or diabetes, also acute infections such as typhoid fever or chronic infections such as syphilis or tuberculosis. The authors' observations did not lend any support to such hypotheses.

The supposedly more frequent occurrence of exostoses in the male sex is ascribed by some authors to traumas.

Endocrine disturbances such as a hypofunction of the thyroid gland have been considered a causal factor by some but in the authors' cases no metabolic changes could be detected. One school of thought suspects a pluriglandular insufficiency involving especially the hypophysis, thyroid, and genital glands.

The authors report their observations in 2 cases of multiple exostoses in males: one patient was 25

years of age, the other 40 years. In the first patient the hereditary factor was evident, the condition being transmitted from one generation to another by women. In reviewing the literature, the authors found no unanimity of opinion as to the greater prevalence of multiple exostoses in males.

The structure of exostoses varies according to the stage of evolution. In a fully developed specimen the following four layers, starting from the surface, may be distinguished: (1) fibrovascular sheath of perichondral type without any traces of ossification at the base of the exostosis the perichondrium merges with periosteum (2) cartilage (3) so-called ossiform tissue containing hypertrophic and calcified cartilaginous cells and fibrous bands with osteoblasts (4) osseous tissue, compact at the periphery and of medullary spongy appearance toward the center. The structure of osseous tissue is analogous to that of normal bones except that Haversian canals have a perpendicular direction to those in the adjacent normal bone. This is an important diagnostic sign because, in false exostoses of periosteal origin the Haversian canals are parallel to the bone from which they originate.

The growth of an exostosis stops when the ossification of the cartilage has been completed.

Absence of participation of the periosteum in the growth of the exostosis is characteristic, and this explains how spontaneous fractures of the pedicle of the exostosis may occur. Such fractures are due to a progressive rarefaction of the bone, and to muscular contractions without any compensatory activity of the periosteum. Occasional spontaneous disappearance of exostoses is attributable to the same condition.

Virchow believed that exostoses derive from a congenital displacement of cartilaginous tissue or a later expansion of the epiphysis. Other writers speak of an atavistic process and consider osteogenic exostoses as a reproduction of an ancestral type. Such a hypothesis is not applicable to cases with multiple exostoses. A teratologic theory is also unsatisfactory. Some authors consider a defect of periosteum responsible for the condition. There is histologic evidence of cessation of periosteal growth at the site of origin of exostoses. The fact that no periosteal lining can be demonstrated at the periphery of the exostosis also supports this theory. Under normal conditions the periosteal sheath and ossification of diaphysis take place simultaneously. If for some reason the advance of periosteum is retarded an excessive growth of the cartilage may take place.

The following processes are responsible for the ultimate structure of normal bone: (1) reabsorption (2) tubulation or transformation of metaphysis into diaphysis, (3) the formation of cancellous tissue (4) cellular division (5) cellular hypertrophy (6) cellular differentiation. A delay of reabsorption or tubulation of a part of the circumference of the bone may lead to formation of an exostosis.

Multiple exostosis may be responsible for pain caused by compression of adjacent tissues, especially

if the formation lies under a nail also for neuritis vascular alterations such as aneurysm, infection, stretching of tendons necessitating tenotomy and perforation into the urinary bladder and other organs.

The prognosis depends on the presence of complications especially malignant degeneration.

As a rule a complete extirpation is not followed by a recurrence. The presence of deformities may demand an osteotomy. JOSEPH K. NARAT, M.D.

Snapper I. Treatment of Multiple Myeloma. *J Am Med Ass* 1947 133 157

A series of 15 patients with multiple myeloma received stilbamidine combined with a diet low in animal protein and pentamidine (diamidine compounds). Good results, characterized by a notable influence on the pain, were obtained.

The dosage schedule of the stilbamidine which was given either intravenously or intramuscularly, and of the pentamidine is well described. To avoid a fall in blood pressure the author recommends the subcutaneous injection of 0.25 c.c. of a 1 in 2,000 solution of epinephrine 10 minutes before the injection of stilbamidine 1/150 to 1/300 of a grain of atropine sulfate is given to patients in whom sweating and dizziness are noticed. Dissociated anesthesia in the region of the trigeminal nerve is one late sign of intoxication.

The author gives a complete analysis of the results obtained and states that the disease is not cured but is checked temporarily. Three case reports are presented. GEORGE E. CLOUTIER, M.D.

Platt H.I. Survival in Bone Sarcoma. *J Bone Surg* 1947 29 6

Certain broad conclusions concerning the effectiveness of various methods of treatment of bone sarcoma are drawn from the Registry of the American College of Surgeons and from individual contributions by Coley, Campbell, Meyerding, Simmons, Macdonald and Budd.

Surgical eradication of accessible tumors is the treatment of choice. The value of postoperative treatment by means of irradiation or toxins seems to be still *sub judice*, but these therapeutic agents should not be withheld from a patient if circumstances permit their systematic use.

The outlook in the case of osteogenic sarcoma is not so gloomy as it appeared at one time. The spindle cell sarcoma (fibrosarcoma) appears to be the least malignant form. The opinions regarding the degree of malignancy of chondromyxosarcoma and extraskeletal sarcoma are conflicting. The prognosis in Ewing's tumor remains grave, despite its response to irradiation. Thirteen of the 14 patients who were recorded as having Ewing's tumors in the Registry report of 1939 survived for 5 years after treatment by surgical measures.

The author has submitted his collection of 161 cases of sarcoma. There were 23 cases with 5 year survival of which 22 were treated by radical opera-

tion and the survivals were fully proved. The other case a pelvic sarcoma, was not subjected to biopsy. Of 2 patients with pelvic sarcoma treated by hind quarter amputation, one lived 5 years and the other is still alive after 7 years. Eight patients in this series survived more than 10 years.

An attempt has been made to compare certain factors in the long survival cases with the same factors in a series of 40 short survival cases (under 3 years). No significance can be accorded to such factors as age, sex, site of tumor and duration of symptoms before the tumor was eradicated. Of 128 patients with accessible tumors which were treated radically, 70 patients survived more than 5 years, and 23 of these for 5 years or more. The author states that irradiation is admittedly a useless form of therapy in tumors of the osteogenic sarcoma type. In Ewing's tumor irradiation before amputation, or irradiation alone in accessible tumors, has no material influence on the ultimate fate of the victim of this most lethal type of bone tumor. DANIEL H. LEVITZKY, M.D.

Nielsen, B., and Snorrason, E.: Arthritis Mutilans. *Acta radiol. Stockh.*, 946 7 607

This report is based on 6 cases of chronic polyarthritides with marked mutilating osseous destruction found in the Bispebjerg Hospital, Copenhagen. It also includes a brief report of 7 cases from the literature.

Marie and Leri published the first case in 1913 under the title of Une variété rare de rhumatisme chronique la main en lorgnette. When the condition was confined to 1 finger these authors called it doigt en lorgnette. Weigelt reported a case in 1929 and Stursberg published a report of 2 cases in 1935. Werthmann reported a case in 1945. Schinz, Baensch, and Friedel reported a case but there were ulcerations which cast some doubt upon this classification. Helfink also reported some cases of doubtful classification.

All of the authors' cases were in women who had been suffering with polyarthritides for years. At a late stage they had all received sanocrysin therapy. There were striking destructive osseous changes in the metacarpophalangeal, metatarsophalangeal, and in the proximal interphalangeal joints. None of the cases revealed special features or complicating affections which might give a hint of the origin of the destruction, and none of the cases presented neuropathic disease or psoriasis. There was a mild anemia and elevated sedimentation rate. Laboratory investigation of the calcium and phosphorus metabolism was not made. Marie and Leri reported severe fatty degeneration of the bone and neighboring tissue. The spongy bone had disappeared and the compact bone was quite thin. There was granulation tissue between the bone ends which led the authors to believe that this was an inflammatory process. Reinhard, in Schueller's sixth case, described a condition resembling osteitis fibrosa. The nerves in that case were intact.

DANIEL H. LEVITZKY, M.D.

LaFerte, A. D.: The Role of the Platysma Muscle in Torticollis Deformity. *Plast. Reconstr. Surg.* 1947 3 73

The author believes that the platysma muscle becomes contracted in the torticollis deformity and that it should be freed laterally from the skin either by blunt dissection or by transverse section of the muscle to the extent of about 1 inch, at the same time that the origin of the sternocleidomastoid muscle is freed or a portion of the two heads excised.

He believes that the use of a skin incision parallel to, and between, the two heads of the sternocleidomastoid muscle permits passive and, later, active assistive exercises from 8 to 10 days after surgery since the pull on the skin is then not transverse to the healing incision. The author uses no cast or brace following surgery but applies bulky dressing, for the first 1 or 10 days, in such a way as to hold the head in a position of correction.

He re-emphasizes the difficulty of obtaining a satisfactory correction in older children because of the discomfort and strain entailed by readjustment of the eyes upon return of the head to its normal position. VERNON C. TUNNEY, M.D.

Maranzuela J.: Some Aspects of Volkmann's Ischemic Contracture (Algunos aspectos de la contractura isquémica de Volkmann). *Rev. esp. cir.* 945 8

Sudden suppression of the blood supply to an extremity produces anatomical and pathological alterations in a muscle. This is known as Volkmann's syndrome. Be it spasm, compression of a vessel between fragments of a fracture, or thrombosis of a vessel, the arterial flow is interrupted and asphyxia pulvix is produced which results in a muscular necrosis with replacement by fibrous tissue. This arterial block interrupts the blood supply to the nerves with nutrient vessels arising from the blocked vessel, and results in a paralysis. Even though the blood supply is re-established after from 6 to 8 hours, the damage is already permanent.

In the muscle one finds zones of muscular sequestra in which the muscle fibers may be identified, but their nuclei have disappeared, and they have lost all signs of vitality. Around the sequestra a leucocytic and fibroblastic barrier is formed, which in invading the zone of the lesion replaces the dead muscle by fibrous tissue and produces the contracture.

Nerve fiber regeneration is possible only when the nerve has suffered Wallerian degeneration. Regeneration is possible if an adequate blood flow is re-established. However the endoneurial collagenization and the necrosis resulting from lack of blood supply are irreversible lesions. Thus, loss of muscle function is due to loss of nerve supply.

Vascular obstruction may be determined by the nature of the pulse, oscillography, the temperature of the affected zone, arteriography and inspection of the vessels at operation.

Muscular lesions may be determined by physical examination, cutaneous electrical stimulation, elec-

tromyography injection of parabrodil in the affected muscle and observation of the absorption by roentgenographic observation

Nerve lesions may be determined by physical and neurological examination cutaneous electrical stimulation electromyography cutaneous temperature change inspection of the nerve and biopsy

Contractures may be avoided by the use of force in the reduction of fractures and by avoiding the use of improper casts and splints.

Within the first 6 to 8 hours the condition may be treated by the administration of oxygen injection of papaverine in the muscle immediate exploration of the artery with arterectomy if indicated to inhibit the spasmodic reflex effect on the collateral blood supply and incision of the fascia to relieve congestion

The actual treatment after the occurrence of the contracture is traction and hyperextension of the metacarpophalangeal articulation, while periarterial sympathectomy or resection of the fragment of the vessel, and infiltration of the ganglion with novocaine is helpful. The muscle may be lengthened by transverse myotomy although the author advocates Max Page's method modified by Mommson as being preferable while Henle advocates the shortening of bone

ARTHUR F. CROZILLA, M.D.

Shepherd J. A.: Constriction of the Extensor Pollicis Brevis Tendon. *Brit J Surg* 1946 34 313

Stenosing tenosynovitis (de Quervain's lesion) is a well recognized and fully documented condition, first described in 1895 (Scheidegger 1928). In adults it usually affects the extensor pollicis brevis or the abductor pollicis longus and in children it has been described as involving the flexor pollicis longus (Zandek 1942). In the common extensor type the patient complains of pain in the region of the radial styloid and of difficulty in straightening the thumb so that manipulation may be required. Passive movements meet with resistance and the thumb may extend with a definite "snap". Classically adduction at the wrist is free if the thumb is included with the fingers when this wrist movement is tested. There may be slight swelling over the affected tendon. The pathology tends to occur when the abductor pollicis longus and the extensor pollicis brevis pass beyond the osteofibrous canal overlying the lower end of the radius and on exposure a fibrous thickening of the tendon sheath is seen. This tissue is hard and cuts like gristle and it restricts the free play of an otherwise normal tendon. The histology suggests the remnant of trauma rather than infection, and certainly many cases occur in women using their hands with work. Treatment may be conservative or surgical. Immobilization may reduce the swelling of the sheath in an early stage of the condition. More satisfactory to the surgeon and patient alike is the operative exposure of the tendon under local anesthesia. The sheath is laid open and the free action of the thumb can at once be demonstrated.

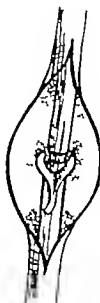


Fig 1 (Shepherd) Diagram of the appearance on opening of the tendon sheath. The long limb of the occluding structure was detached from the roof of the sheath; the two short limbs were attached to the floor of sheath and the whole tendon. Note the groove in the tendon, from which the structure slipped off with a jerk. The top is the proximal part, the bottom, the distal part.

The author reported the case of a naval officer aged 42 who complained of pain in the right thumb. Preoperatively a diagnosis of de Quervain's lesion was made. With a pneumatic tourniquet on the upper arm, an incision was made along the line of the extensor pollicis brevis from the radial styloid 1 inch distally. A tendon sheath of normal thickness and consistency was exposed and slit open in the length of the incision to reveal the tendon tethered by a peculiar band of tissue. The paired limbs of the structure arose from the floor of the sheath on each side of the tendon and embraced the latter tightly over the volar aspect—tightly enough to cause a local constriction of the tendon. On extension of the thumb the band jumped out of the groove it had printed on the tendon—the intermittent symptoms were thus readily explained. The obstruction was excised by dividing it at the three attachments to the sheath. A probe was passed distally for an inch but no further obstruction was encountered. The extensor pollicis brevis may share a common canal with the abductor pollicis longus at this point but in this case the tendons had separate compartments. It was considered wise to inspect the adjacent sheath but on slitting it open no abnormality was found. The abductor sheath was approximated with 5 fine catgut sutures the abnormal sheath was left open. The skin was closed with silk sutures.

Postoperatively the patient was free from all symptoms. It was believed that a congenital origin for the condition was most likely.

C. FRED GOINGBARGER, M.D.

Moulouquet P., Delannoy E., and Drieschner: Giant Cell Tumor of the Femoral Neck Treated Surgically and with X rays. Fatal Evolution of Sarcoma of the Pelvis (Tumeur à myélopaves d'os fémoral traitée par chirurgie et rayons X. Évolution mortelle d'un sarcome de bassin) *Année chir. Fr.* 946 72 556

A giant cell tumor of the left femur in a 23 year old woman was recognized when a spontaneous fracture occurred. Curettage and bone graft followed by intensive x ray therapy were employed after a preliminary traction with Kirschner wire for 8 days to obtain reduction. Reparative processes were slow and insignificant and 14 months after the operation a new osteolytic phase appeared. A new bone graft was placed and the patient felt relatively well after that operation, but 7 months later the pain reappeared and tumor masses in the left ischium and the rest of the pelvis. The patient succumbed to her condition before an interilioabdominal amputation could be performed.

The authors consider their observation as an example of the transformation of a giant cell tumor into a malignant neoplasm. Another hypothesis may be considered namely the development of a pelvic sarcoma in the vicinity of but independent from the giant cell tumor of the femur. It should be remembered that the irradiation of osseous tissues may induce the development of an osteogenic sarcoma, and because of this it has been suggested that instead of heavy cytolytic doses of x ray only smaller doses (such as are used in the treatment of infectious lesions) be employed in the therapy of giant cell bone tumors. JOSEPH E. NARAT, M.D.

SURGERY OF THE BONES, JOINTS, MUSCLES, TENDONS, ETC.

Murray A. R.: Reconstructive Surgery of the Hand. *Br. J. Surg.* 946 34 3

This article deals with three main methods of reconstruction of the severely damaged hand: (1) the transposition of one of the remaining digits of the same hand (transposition of the index finger to make a thumb); (2) a whole finger graft from the other hand (a toe has been used quite successfully, but a finger gives a better functional result); and (3) the man's manufacture of an artificial finger from living tissue.

The essential anatomical structures which subserve the basic function of the hand are two digits capable of being brought into apposition with each other. In other words, a thumb and one finger. Functionally there is little to choose between a hand without fingers and one that has lost the thumb.

The author has attempted arthroplasties of the digits with metal hinges.

Six cases are described as illustrations of the three methods of reconstruction.

This type of surgery is most difficult and the end results described warrant thorough study of the methods by anyone contemplating reconstruction of the crippled hand. VICTOR C. TURNER, M.D.

Fowler S. B.: Mobilization of the Metacarpophalangeal Joints. Arthroplasty and Capsulotomy. *J. B. & Surg.* 947 29 93

A series of cases presenting destruction of one or both joint surfaces of the metacarpophalangeal articulations is presented.

Arthroplasty is indicated in such joints if there is less than 30 degrees of motion in a useful arc, and if mobilization will restore a practical degree of function to the digit. The technique is as follows:

An incision 5 cm. long is made over the dorsolateral aspect of the joint, and the joint is exposed through the space between the interosseous and extensor tendons. A joint space of about 1 cm. is obtained largely at the expense of the proximal phalanx, which is cut transversely. The metacarpal head is bevelled off dorsally (Fig. 1). An interposition membrane, composed of the fascia overlying the fasciculi of the distal one-third of the thigh is meticulously applied to both joint surfaces. If there has been a loss of intrinsic muscle substance or marked shortening of the metacarpal, it is important to transfer the flexor digitorum sublimis tendon into the lateral bands of the extensor aponeurosis. A cast is applied and traction with the joint at 60 degrees of flexion is used postoperatively. Exercises are begun in 7 days and the cast is removed for further exercises in 3 weeks. A removable splint which flexes the joint is applied if there is incomplete flexion up to an additional 2 months.

The author regards the metacarpophalangeal joints as the most favorable in the body for arthroplasty. The results in his 13 patients appear to have been generally good, but detailed case reports are not presented.

Capsulotomy is advised for stiff metacarpophalangeal joints when the joint surfaces are intact and when physical therapy has failed. The operation will fail if any factor necessitates extension of the finger immediately following surgery. The extensor tendons must be free and allow complete flexion. Extreme caution must be exercised if a capsulotomy is done on a hand with circulatory insufficiency for gangrene of the fingers may result. Simple removal of the collateral ligaments, which are adherent to the surface of the metacarpal head, will not restore normal motion because the gliding of the phalanx around the metacarpal head will not occur.

The technique of capsulotomy is as follows:

An incision 1.5 cm. long is made on the dorsal aspect on both sides of the affected joint. The collateral ligament is completely removed on both sides of the joint. If the extensor tendon is adherent to scar tissue, the interphalangeal joints will extend when the metacarpophalangeal joint is flexed. It must be freed. If the phalanx does not glide around the metacarpal head, the capsule must be stripped from the head either by forcible flexion or by use of a blunt dissecting probe. If the extensor tendon subluxates to the side of the joint when it is flexed this must be corrected by section of part of the lateral expansion of the tendon on the side of the subluxation, or by

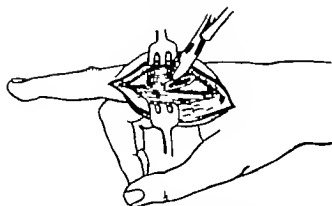
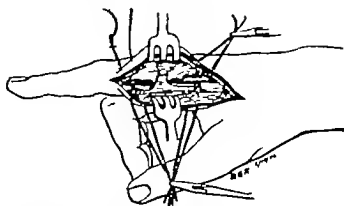


Fig. 1 (Fowler) Arthroplasty of the metacarpophalangeal joint. Left, Proximal phalanx severed transversely



Metacarpal tapered on flat. Right, Fascia with weblike consistency used between joints.

tightening of the opposite side. Postoperative splinting or traction to keep the joints flexed is necessary. After 3 weeks a removable splint is applied for a month or longer if the deformity tends to recur. From 80 to 90 degrees of motion are to be expected following capsulotomy but imperfect results occur if surgery is improperly done or if other factors remain in the hand which render proper use of the joint impossible.

NEWTON C. MEAD, M.D.

shaped with reamers care being taken to sacrifice a minimum amount of bone the mold is applied and the greater trochanter is introduced into the acetabulum. The divided muscles are transplanted to the infratrochanteric region and fastened by heavy silk sutures or by wire.

4. Intertrochanteric mold arthroplasty was employed in cases in which the greater trochanter was so atrophied that it could not be shaped and used for a modified Colonna operation.

Law described the postoperative results in the series of 42 cases which he assessed by clinical and roentgenographic examinations while attempting to determine the value of the operation both to the patient and to the surgeon.

Pain is minimal in the majority of the cases. Mobility of the hip joint is considered in conjunction with stability. The great majority of the patients are able to dress themselves sit in low chairs for protracted periods, and to perform their ordinary household and social activities. Gait is dependent upon strict training and muscle re-education with particular attention to heel toe movement. Residual deformity is minimal in patients treated by the routine mold arthroplasty and is more marked after the Colonna and intertrochanteric arthroplasty procedures. The following conclusions have been drawn from this study:

1. Eighty five per cent of the results are satisfactory to both patient and surgeon.
2. There is progressive improvement in function for 3 or 4 years after operation. The condition then becomes stationary. (The postoperative period in the oldest case is now 7½ years)
3. In this series of patients low back symptoms stiff knees, or postural difficulties were not present.

RUDOLPH S. REICH, M.D.

Fett, H. C., O'Connor J. J. and Johnson, J. A. Experiences in the Treatment of Traumatic Cavitation in the Upper Tibia. *Am J Surg* 1947 73 11

After reviewing much of the literature on the management of compound fractures involving gross

Smith Petersen M. N. Larson C. B. Aufranc, O. E. and Law W. A.: Complications of Old Fractures of the Neck of the Femur. Results of Treatment by Vitallium Mold Arthroplasty. *J Bone Surg* 1947 29 41

Mold arthroplasty consists in first creating a joint as nearly perfect mechanically as possible, and then guiding nature's repair by means of an inert mold and carefully supervised exercises. As applied to the treatment of complications of fractures of the femoral neck, the procedure is varied according to the extent of the degenerative changes.

1. In aseptic necrosis of the head, limited in extent and occurring after union of the fractured neck a routine mold arthroplasty is indicated. This consists in reshaping the head and acetabulum so as to create two congruous surfaces. The crater representing the necrotic area is excised down to bleeding bone and, in cases of relatively extensive necrosis the resulting defect is packed with cancellous bone from the iliac crest. The reshaped femoral head is covered with a vitallium mold and replaced.

2. When the aseptic necrosis involves most of the head, even though the fracture has united a modified Whitman reconstruction operation is indicated. This consists in discarding the dead head, reshaping the viable remaining neck covering it with a vitallium mold, and replacing it in the acetabulum.

3. In nonunion with a dead head and more or less complete absorption of the neck, a "modified Colonna" operation is indicated. This consists in creating a deep acetabulum and freeing all muscle attachments from the greater trochanter down to the infratrochanteric region. After the trochanter has been

tissue loss, the authors present 7 cases of cavitation in the proximal tibia. The article is complete with photographs and roentgenograms. All of the patients had compound fractures of the tibia and fibula and 5 patients had peroneal nerve paralysis. Since the loss of substance (both bone and soft tissue) was already extensive, and the tibial articular surface was involved, classic saucerization would have jeopardized the integrity of the tibial plateau still further.

Sequestrectomy with elimination of spurs overhanging bone edges and infected bone, was carried out, but saucerization was done only in the distal portion of the wound and to an extent that did not threaten the architectural integrity of the tibia. All limbs were immobilized in plaster and in 4 cases pin traction in addition was used, but osteomyelitis about the pins necessitated their early removal. Chemotherapy was indicated and used both locally and systemically, and in 3 cases amputation was rendered unnecessary, by the use of penicillin.

The use of antibacterials in the wounds was purely for the purpose of promoting clean, healthy granulations and rapid epithelization. *Bacillus proteus* was rapidly eliminated by the use of 1 per cent acetic acid soaks. *Permease* was found to be unsatisfactory and sulfonamides valueless in local treatment. Tyrothricin and penicillin were the most effective local agents. Aseptic technique was employed in all changes of dressing.

Weight bearing in cast or brace was begun as early as 2 to 3 weeks and clinical findings permitted, and the authors state that all patients are now active without braces, although all have limitation of knee motion. Epithelization is complete in all but 2 and any reconstructive procedures, bone or soft tissue, are considered inadvisable lest latent infection be reactivated.

FRANCIS E. BRIDGEMAN, M.D.

FRACTURES AND DISLOCATIONS

H. Ros Codorniu A.: Fractures and Dislocations of the Elbow (El codo: sus fracturas y luxaciones) *Ciruj. por locomotor* 945

The author has written in Spanish an extensive and well illustrated monograph on fractures and dislocations of the elbow. The book is divided in 20 chapters which review the phylogenesis, anatomy, mechanics and general exploration of the elbow. The various types of fractures and their management are considered in great detail. The post-traumatic ossification, and the neurological complications in the elbow are also discussed extensively.

The presentation of this study is very well organized and its value is enhanced by very beautiful illustrations of all types. WILLIAM E. RICHARDS, M.D.

Stanger J. K.: Fracture Dislocation of the Thoracolumbar Spine, with Special Reference to Reduction by Open and Closed Operations. *J Bone Surg* 947 29 07

This article is based upon an analysis of 43 patients treated at the Royal Victoria Infirmary during a

period of approximately 6 years. In the district served by this hospital a great many serious industrial accidents occur especially in coal mines. At this hospital the indications for operation in fracture dislocation of the spine are

- 1 Section of the cord
- 2 Pressure on or stretching of the cord without section
- 3 Hematomyelia or edema

Unless the paraplegia is partial, it is impossible to tell whether or not there has been a complete severance of the cord. When paraplegia is not present in cases of fracture dislocation the complete correction of the skeletal lesion is indicated so that a maximum recovery of function will occur.

A closed reduction was attempted on 3 patients with complete paraplegia. There is a higher incidence of paraplegia at the thoracolumbar junction than in the lower lumbar region. The extent of skeletal damage is no indication of the degree of cord trauma. A simple interlocking of the articular facets in the thoracolumbar region with a minimum shift is often associated with complete paraplegia. The method of reduction seems to play little or no part in the possibility of recovery. In this series of 43 cases closed reductions appeared to give better results than open ones.

In the lower lumbar region, gross displacement may be present without paraplegia. The early appearance of the first signs of recovery of sensation or of motor power is no indication of the prognosis.

Hyperextension without anesthesia resulted in reducing the fracture dislocation in 1 case.

RICHARD J. BRIDGEMAN, JR., M.D.

McLaughlin H. L.: Adjustable Internal Fixation Element for the Hips. *Am J Surg* 947 73 50

Rigid and accurately fitted internal fixation is the method of choice for managing fractures about the hip, as well as for reconstructing the upper femur in certain cases. The devices in use have a proximal part which is driven into the femoral neck and head, and a distal part which is fixed to the femoral shaft by screws. All the devices present certain limitations; they may be difficult to apply or fail to provide secure fixation. It is desirable that there be range of nail or blade lengths as well as of the angle at the junction of the two components, which in no way compromises their structural integrity.

One or both of these desiderata are wanting in the devices heretofore available. The axis of the femoral shaft must be shifted to coincide with that of the plate if the proximal arm is not introduced into the trochanter at exactly the optimum angle. The uneven distribution of strain thus created jeopardizes the maintenance of position and the security of fixation. If the nail is too long, collapse of cancellous bone during bearing may result in protrusion into the acetabulum.

The Fracture Service of the Presbyterian Hospital, New York, has developed a mechanism which fulfills all these requirements. A hemispherical head

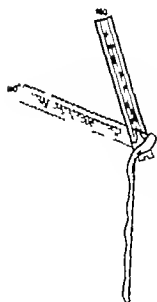


Fig. 1

Fig. 1 (McLaughlin) Side view drawing of the adjustable hip fixation instrument. The nail and plate may be locked together at any angle between 120 and 160 degrees.

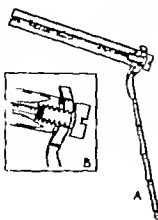


Fig. 2

Fig. 2 Side view of the adjustable instrument in cross section. A, Nail and plate are fastened together by a heavy set screw passing through a slot in the curved upper portion of the plate to engage 5 full threads in the head of the nail. B Inset shows an enlarged drawing of the locking mechanism.



Fig. 3

Fig. 3 The apposing hemispherical surfaces of nail and plate are buried in such a way as to assure reciprocity regardless of variations in the angle between the two. Tightening of the set screw locks these reciprocal surfaces together in the desired position.

Fig. 3. Front view of the instrument. The plate may be rotated around the center of the axis formed by the set screw to conform to variations in flexion or extension of the femoral shaft.

is buried on a Smith Petersen nail to fit an identically curved surface on the proximal end of a plate. The longitudinal slot in the curved surface of the plate permits accurate locking of the plate and nail at any angle between 120 and 160 degrees by a heavy set screw which engages 5 full threads in the nail head. The plate may be rotated on the axis of the set screw a full 360 degrees. Nails are available in all lengths, and plates are used mostly in the 5 and 7 inch lengths.

Exposure through the interval between the tensor fascia femoris and the lesser gluteus muscles is most satisfactory. To avoid the subgluteal dead space created when the maximus muscle falls back the deep tensor fascia is incised separately from the superficial fascia and so that its posterior segment remains as a sling to hold the maximus in normal position. Fascial closure without tension is facilitated.

The type of fixation described causes an appreciable bulge of metal from the shaft of the femur so that snug fascial closure is desirable. No subjective symptoms have appeared in spite of this readily palpable projection.

Details of the technique of inserting and locking the nail and plate are important in securing solid fixation. Because of the tendency of fractured cancellous bone to collapse the point of the nail should penetrate not closer than 1.5 cm. to the acetabulum to allow for this settling and to prevent penetration to the joint surface.

FRANCIS E. BRIDGEMAN, M.D.

Kleinberg S.: Recurrent Dislocation of the Patella. *Bull Hosp Joint Dis* N Y 1946 7 141

Recurrent dislocation of the patella is due to abnormal laxity of the supporting tissues which allows displacement of the patella upon or to the outer side of the external condyle. The following etiological factors were found to be responsible for recurrent dislocation of the patella in a series of 35 patients operated upon in the author's hospital since 1936.

1. Knock knees in which the pull of the quadriceps tends to dislocate the patella.

2. Defective development of the lateral femoral condyle. Here the barrier to lateral displacement of the patella is lost.

3. Imperfect development of the patella: the articular surfaces of the patella form a less acute angle than normally.

4. Laxity of the capsule and patellar expansion on the inner aspect of the knee.

5. Abnormal length of the patellar ligament allowing excessive mobility of the patella.

6. Trauma severe enough to cause dislocation of the patella in a normal knee.

Recurrent dislocation of the patella usually occurs for the first time in childhood or early adolescence. Recurrence of dislocation of the patella may then follow minor incidents like stepping off a curb, turning while dancing, sudden straightening of the knee.

The subjective complaints are characterized by a sense of weakness in the affected knee. Reduction of the dislocation can usually be accomplished with

case by the patient or the surgeon. The first incident of dislocation usually is followed by swelling and pain lasting for a few days. Subsequent dislocations may not be associated with any discomfort or loss of motion. In some instances, especially in dislocations following severe trauma, reduction can be accomplished only by surgery.

Röntgenograms of the patella taken in an infero-superior direction with the patient in a prone position and the knee flexed to 70 degrees are helpful in the study of the bony structures with regard to recurrent dislocation of the patella.

Operative repair is the treatment of choice. Operations devised for the repair of recurrent dislocations of the patella generally aim to correct a manifest bony deformity, i.e. osteotomy of the femur or bones of the lower leg for knock knees or elevation of the congenitally underdeveloped lateral femoral condyle (Brackett-Albee). The purpose of the operative procedure may be designed to change the direction of pull of the patellar ligament, i.e. transfer of the insertion of a portion of the patellar ligament to a more medial position on the tibia (Goldthwait) or transplantation of the patellar ligament with a block of bone to a more medial position on the tibia (Hauser). The operation may seek to diminish the slack of the soft tissues on the inner aspect of the knee, i.e., excision of a fragment from the inner capsule of the knee and reefing of the cut edges (Krogh). Finally, it may be the aim of the operation to establish a check against outward displacement of the patella, i.e., suture of a strip of tissue of the lateral aspect of the capsule to the medial femoral condyle (Campbell) or anchoring of the patella to the medial condyle of the tibia by using a strip of iliotibial band (Ober) or fascia lata (Soutter-Gallie).

The reported results of all these procedures have been good. The author presents 6 cases of recurrent dislocation of the patella in detail. The Goldthwait type of repair was used in every case with or without reefing of the inner capsule of the affected knee. The patients were re-examined up to 3 years after the operation and were found to have had no recurrence of the dislocation of the patella and had full and painless range of motion.

GROVER I. REED, M.D.

Denis, R.: Bone Grafting. I Pseudarthroses and Recent Fractures of the Tibia (L'ostéogénèse par éclissage à l'os purum dans les pseudarthroses et les fractures récentes du tibia). *Rev. chi.* Par 946 65 3

The use of the bone grafting method described in this article was started by the author in 1929. At that time a rectangularly shaped graft was taken from the healthy tibia and placed in a trough cut longitudinally across the fracture line of the affected tibia. The graft was fixed with pegs made out of living bone. This procedure was long and tiresome but it appeared to be the operation of choice for repair of pseudarthroses of the tibia. Then Orrell reported his work with os purum and heterogeneous

grafts prepared from beef bone treated with potash and acetone until it was free of albumin, fat, and connective tissue. Orrell stated that these grafts were very well tolerated and that the os purum had osteogenic qualities. The os purum was prepared on a large scale by a Swedish concern. The grafts were available in any size and shape and were cut accurately to the millimeter. They were firm and gave rigid fixation to the bone. There was no need to take grafts from the healthy bone which simplified the procedure considerably. A standard procedure was followed.

Reduction of the fracture was done as accurately as possible sometimes with the use of the fracture table. Two holes were drilled in the bone (5 mm. in diameter) 58 mm. above and 58 mm. below the fracture site. These 2 holes penetrated into the medullary cavity and lay in the longitudinal axis of the bone. They were then connected by a channel made with a double blade electric saw. The channel was made 120 mm. long and 5 mm. deep. Since the graft had to fit tightly into the channel the walls of the trough had to be even and smooth. It was also important to level the bottom of the channel since the graft fitted into it. A specially designed instrument (*raise de fond-rasp*) was used for this purpose.

The os purum, which measured 20 by 5 by 35 mm. was sterilized by boiling and inserted into the prepared trough by means of slight blows of a mallet. It was fixed in place with stainless steel screws. The anterolateral aspect of the tibia is freed by dissecting away the anterior tibial muscle for a length of 15 cm. and a width of 12 mm. Four holes 3 mm. in diameter were made into the tibia perpendicular to the graft. Four specially designed screws were used and tightened in place with the help of a screwdriver designed after the one used in the mirror trade. The excess of graft extending above the tibial surface was removed with a saw with an oscillating blade. Excellent results are obtained by observing the following points:

1. Firm pressure of the bone fragment upon one another.
2. Firm immobilization.
3. Strict aseptic technique. It is a mistake to believe that the aseptic technique was satisfactory just because there was no abscess formation.

The tarnishing of screws, a zone of rarefaction around the graft, and the formation of fibrous tissue around the plate are due to latent infection and not to foreign body reaction. Sharp dissection with the scalpel or scissors (never with a sponge) perfect hemostasis, avoidance of the denudation of bone and dead spaces, drainage of the wound for 24 hours postoperatively, and a "no touch" technique are very important factors in carrying out this procedure.

Pseudarthroses are the most important indications for this bone-grafting procedure. The fracture site is not excised unless the fragments are badly displaced and cannot be reduced by any other means.

The fibrous tissue that lies between the bone ends ossifies if firm fixation is maintained

In spite of Orrell's assurances of the osteogenic qualities of the os purum graft the authors were very skeptical but clinical experiences support all his statements. The osteogenic qualities of the os purum resist a certain amount of infection and persist even after the graft is removed.

An area of rarefaction around the graft indicates that there is pus around the graft. In spite of the infection around the graft it is left *in situ* until there is evidence that union has begun to form. The removal of the graft will not interfere with further consolidation. Pseudarthroses following an old compound fracture or an operation are no contraindication to the use of os purum as bone grafting material. Its place in the treatment of recent fractures is limited.

The authors have used the os purum in 27 cases (among more than 1,000 bone grafting operations). There were three groups.

The first group included infected fractures which showed fibrous union at the time of operation. The grafting operation was done from 9 days to 3½ years after the accident.

The second group consisted of fractures in which pseudarthroses followed delayed union after orthopedic surgery and bone grafting operations.

The third group included simple fractures of the tibia which were grafted immediately after the accident.

There were 11 patients in the first group. In 9 cases a curettage was done as a preliminary procedure and in 2 cases a bone grafting operation was done prior to the os purum operation. There were 10 cases of postoperative infection. In 7 cases there was no sign of incorporation of the grafts after a period of from 2 to 10 years respectively. There were 2 partial incorporations of the grafts after 8 years and 1 complete consolidation after 5 years; there was 1 amputation. There was bony union in 10 cases. The result was classified as very good in 4 cases, good in 6 cases and fair in 1 case.

There were 10 cases in the second group. In 5 cases there were bone grafting operations or other orthopedic operations which were done prior to the os purum operation. The os purum grafting operations were done from 2 to 8 months after the accident. There were no postoperative infections. There was complete incorporation of the graft in all of the cases. There was union in every case without shortening or deformity. The results were classified as very good after follow ups of from 2 to 11 years.

There were 6 cases in the third group. Four cases with diaphyseal fractures became infected and did not tolerate the graft. The 2 others metaphyseal fractures healed per primam and incorporated the graft. There was eventual union in all cases without shortening or deformity. One result was classified as very good after 9 years, 4 results as probably very good after follow ups of from 12 to 15 months and 1 result as questionable after 3 months.

In conclusion the author states that the os purum graft is preferable to inlay and intramedullary grafts. He cites the following points:

The inlay graft although easily applied, gives in sufficient fixation, while the intramedullary graft requires a mutilating operation. The pseudarthrosis must be resected, which results in shortening of the part and in sacrifice of readily ossifiable tissue. The immobilizing qualities of an intramedullary graft are not satisfactory. The intramedullary graft cannot very easily be removed should infection warrant it.

Failures of os purum grafting are due to faulty technique or inadequate fixation. The os purum is more resistant to infection than fresh bone. The osteogenic power of the graft has not been overestimated by its discoverer as shown by clinical and roentgenographic control in the author's cases. There were no histological studies made.

An os purum graft is preferable to an autogenous graft or bone plating in the following cases:

1. In pseudarthroses and noninfected delayed unions, i.e., old simple fractures or old compound fractures which do not show clinical infection.

2. Pseudarthroses following previously infected fractures with scar formation in the soft tissues and skin. The persistence of a fistula does not constitute an absolute contraindication. Penicillin does not help much in these conditions. In doing the os purum grafting operation one must be prepared to remove the graft as soon as union is seen on x-ray examination.

3. Recent simple fractures in the metaphyseal portion of the tibia where bone plating will not give sufficient immobilization. The femur, humerus, radius and ulna may tolerate large metal plates well, but the tibia does not tolerate them because of the proximity of the skin. GAZDAR I REZAS, M.D.

D. Aubigné, R. M., and Denhart: The Treatment of Malunited Fractures of the Ankle (Traitement des cas vicieux du cou-de-pied). *J. chi., Par.*, 1946 62: 365.

Malunited fractures of the ankle mortise are difficult problems in orthopedic surgery. No article dealing with this problem was published since the last French Orthopedic Congress in 1938 yet the interest in this problem has persisted. Malunion of the ankle mortise was treated in 24 cases. The results were compared with those published in the Anglo-American literature accessible to the authors after the liberation.

The cardinal symptom of malunited fractures of the ankle joint is pain. There is a mechanical reason for the pain. The astragalus which transmits the weight to the foot is malaligned which causes either a flatfoot with a valgus deformity or an equinus deformity with posterior subluxation. Walking on such a deformity results in tearing of the ligaments, pressure sequelae, and pain. The pain is located in the tibioastragalar joint but also secondarily in the subtalar, tarsal, and tarsometatarsal joints.

This fact is well demonstrated by residual pain in the joints of the foot even after successful fusion of the ankle joint in a deformed position. If the deformity is corrected, the pain ceases. Degenerative arthritis is the other factor responsible for pain in the ankle joint and has to be taken into consideration when the indications for operation are evaluated. Necrosis of the articular cartilage occurs either because of malalignment or extension of the fracture to the joint surface and gives rise to exostoses and pathological calcification. There is also diffuse osteoporosis of the affected region. Trophic and arthritic disturbances of the bones are associated with similar disturbances of the soft parts, i.e. edema, cyanosis, pigmentation of the skin, and atrophy of the muscles. The changes in the soft parts disappear after fusion of the affected joint is accomplished.

Fusion of the ankle joint very rarely occurs spontaneously. Arthrodesis is a very valuable operation in the treatment of malunited fractures of the ankle joint. In a series of 48 cases (Halford and Hullock) degenerative arthritis was found in the ankle joint in 15 cases, in the subastragalar joint in 7, in the naviculocuneiform joint in 4, and in the distal tarsal joint in 1 case; the rest of the cases showed malunion without concomitant arthritis.

The surgical treatment of the malunited fractures of the ankle has two aims: (1) the re-establishment of normal transmission of the body weight from the leg to the foot, and (2) whenever possible, the preservation of motion in the tibioastragalar joint. In cases of partial ankylosis of the ankle joint no attempt should be made to preserve motion but ankylosis should be encouraged.

There are five operative procedures used in the repair of malunited fractures of the ankle joint: resection of the tibiotarsal joint, astragalectomy, osteotomy at the malunion site, supramalleolar osteotomy, and arthrodesis of the ankle joint. The plastic resection of Syme is impractical and always has had poor results in the hands of the authors. Astragalectomy cannot be justified in the light of theoretical considerations or of the results. It is well known that incongruity of the astragalus in its mortise is followed by arthritis and pain. More pain and arthritis is therefore to be expected if the tibia is placed on the calcaneus. Polleux reports the end results in 7 cases of astragalectomy: a cases required further operative repair; 1 result was very poor; 3 results were fair; and 1 result was good but the patient had to wear an orthopedic shoe. Pain is due to displacement of the bones in the nearthrosis. Ollier pointed out that there is often varus deformity in these cases with ulcer formation on the outer aspect of the foot. Ankylosis of the ankle joint in a right angle is preferable to ankylosis after astragalectomy.

The present report is based on a series of 26 of malunited fractures of the ankle. The cases are put into four categories:

- Valgus deformity
- Valgus deformity with posterior subluxation of the astragalus

c. Varus deformity

d. Anterior subluxation

Osteotomy at the malunion site. This procedure was done in 13 cases of which 10 were followed up for a long time; the results were classified as excellent in 4 cases, good in 1 case, and bad in 1 case. In the last patient the deformity recurred. All patients had valgus deformity with tibiofibular diastasis; in 3 cases there was a posterior tibial marginal fragment without displacement, and in another 2 there was posterior subluxation. At least two-thirds of the roof of the ankle mortise was preserved in all of the cases. Osteotomy at the site of the deformity is indicated in cases of malunited fractures of the ankle with valgus deformity and in which at least two-thirds of the articulating surface of the roof of the mortise is intact.

Supramalleolar osteotomy. In this operation a wedge osteotomy is done with the base of the wedge directed toward the concavity of the deformity. In 1 case a linear rotation osteotomy was done. In this case there was union of the fracture and rotation of the lower fragment, but with maintenance of the longitudinal axis. The result was satisfactory.

The supramalleolar osteotomy is done in cases in which the deformity is located in the malleolar region. There were 14 patients subjected to operation and followed up for a long time; the results in 13 in which malunion and ankle fusion followed supramalleolar osteotomy of the ankle joint were classified as excellent. In 6 cases there was some motion in the ankle joint which was worth saving. In 1 of these cases a shortening of the fibula had to be done at the same time. It was followed by a excellent result. The remaining cases presented valgus and varus deformities with a slight degree of posterior subluxation. There were 2 failures in which there was some degenerative arthritis; these 2 cases should have been treated by arthrodesis instead. It is important to keep in mind that in doing the osteotomy 1 or 2 cm. above the ankle joint the blood supply to the articulating cartilage may be impaired and this will be followed by cartilage degeneration.

Supramalleolar osteotomy is indicated in cases in which there is malunion with perfect tibioastragalar articulation. When in doubt arthrodesis is done.

Ankylosis operations. The fear that ankylosis of the ankle joint will severely interfere with normal locomotion is utterly unfounded. In fact, ankylosis is preferable to limited motion in the ankle joint. In the absence of pain the subastragalar and distal tarsal joints compensate for the lack of motion in the ankle joint. It is very important to obtain fusion in a favorable position and have good alignment of the foot in relation to the leg. Generally there are two procedures: simple fusion of the ankle joint with a wedge osteotomy of the wedge on the astragalus. It is not at all a long immobilization.

fusion in the ankle joint is designed to eliminate arthrodesis associated with the latter procedure in the tibia and hall

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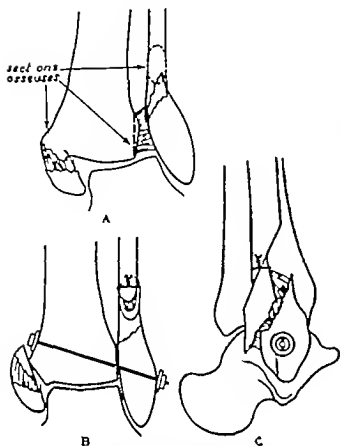


Fig. 1 (D'Aubigné Denisart) The osteotomies should permit perfect reduction of the external displacement. The medial malleolus is osteotomized just proximal to the callus formation. Osteotomy of the outer malleolus allows lengthening of the bone at the end of the procedure.

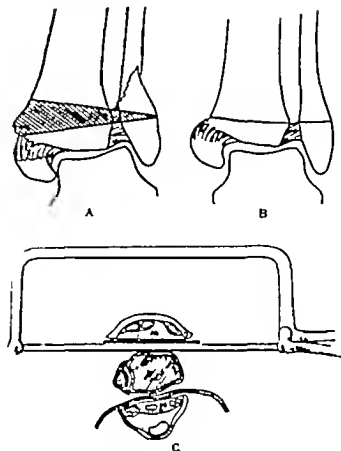


Fig. 2 The technique of supramalleolar osteotomy. A, Outline of the wedge to be removed. B, Correction after osteotomy. Preferably the osteotomy is done a little higher up. C, The plans of osteotomy diagrammatically demonstrating the use of the narrow bladed saw of Farabeuf.

walking was resumed too early fusion failed to occur and pain persisted.

All old malunited fractures of the ankle should be operated on if pain persists even if the displacement is only slight. Often slight tibiofibular diastasis is very painful and therefore disabling.

The three most commonly used operations are described in detail.

Osteotomy at the malunion site. Two incisions are made, one over the lateral aspect of the ankle and the other over the medial aspect. The osteotomy of the medial malleolus is somewhat above and parallel with the fracture line and is directed toward the angle formed by the roof and the medial wall of the ankle mortise. Osteotomy of the fibula is done on a slightly higher level. The tibiofibular ligament is then severed. The ankle mortise is molded into shape. The fibula is usually shorter and must be lengthened. The reduction is checked by roentgenography in the operating room. If satisfactory a bolt is inserted from the lower end of the fibula to the upper end of the tibia and tightened with 2 nuts on 2 washers (Fig. 1). In cases with a large posteriorly displaced fragment this procedure is only feasible when the fractures are relatively recent. Calcaneal traction is necessary in the repair of these deformities.

Edge osteotomy. The angle of the deformity and the size of the wedge are determined preoperatively. A lateral and medial incision are used. The incisions are carried down to the bone and the periosteum is elevated on the anterior and posterior aspects of the tibia and fibula. A flexible saw blade is placed anteriorly and another blade posteriorly to the bones. The posteriorly located blade is put on a saw and while the anterior blade helps retract the soft tissue the bones are osteotomized. The same procedure but in reverse is followed with the anteriorly located saw blade. The wedge osteotomy is completed. The position is held by two Kirschner wires (Fig. 2).

The distal channel made by the saw through the astragalus is made parallel to the sole and at least 1 cm. distal to its proximal articulating surface. The proximal channel extends through the tibia and its plane is perpendicular to the longitudinal axis of the leg. The wedge comprises almost all of the astragalus pulley the roof of the ankle mortise the external malleolus, and often all of the medial malleolus.

For arthrodesis the anterior approach is used. An 8 cm. long incision is made. The anterior tibial muscle is retracted medially and the extensor digitorum communis and hallucis muscles laterally. The lower end of the tibia and the neck of the astragalus

are exposed by subperiosteal dissection. The joint is opened widely by cutting the deltoid and fibular ligament. Cartilage is removed from the tibia, fibula, and astragalus. A trapezoid shaped bone graft is cut from the tibia with an electric saw. A hole is scooped out on the proximal aspect of the neck of the astragalus, and while the foot is held in position, the graft is slid down into the prepared cavity.

GROVER L. RAME, M.D.

ORTHOPEDICS IN GENERAL

Le Vay A. D.: A Psychosomatic Approach to Orthopedic Surgery. *Lancet* Lond., 1947 1 15

Le Vay goes on record as stating that the requirements of an orthopedic surgeon do not consist in the mere fitting of a bone graft or application of a well fitting cast. He should have at his command a practical modern conception of psychosomatic medicine. In other words, an orthopedic surgeon must treat the mind as well as the body. They are inseparable. The aggravation or the basic emotional instability of patients suffering from an orthopedic disease must be recognized early and dealt with concomitantly.

The many problems confronting a surgeon these post-war days are not entirely physical. They may be in part (1) psychogenic, (2) viscerogenic, (3) personal maladjustments, (4) fear or (5) a combination of the aforementioned factors. It is reported that in many orthopedic diseases, emotion may greatly modify muscular tension, posture, and even osseous structures. Its psychological mechanism is not clearly portrayed, but the author postulates as follows:

1. If a crippled person is unable to make adjustment, he may escape into a fantasy world (children).

2. Illness and invalidism warrants general attention from the family and the patient becomes the focus of attention. Obviously the psychoneurotic, having made these secondary gains, is reluctant to lose them.

3. Analysis reveals further that a tendency toward accidents in industry is attributable to an unconscious, childish, fantastical desire for punishment, hence the inexplicable industrial casualties.

Rehabilitation of a patient may be retarded especially in long term cases when a surgeon fails to win the respect and affection of a patient. A trivial error may ignite a spark in a patient which may produce an unsatisfactory relationship between the surgeon and patient and thus delay healing. A surgeon should scrutinize his own behavior when dealing with troublesome and irritating patients for a response in the same vein is to enhance neurosis.

Clinical evolution of psychosomatic disorder in deformities such as Dupuytren contracture may have their origin in a tenacious grasping person in unconscious muscular activity of the palmaris longus muscle which sets up a chronic tension along the fibers of the palmar fascia and results in hypertrophy and contracture. Similarly, in a patient suffering from visceral neurosis the motility and behavior of the organ affected primarily and this affects the intrinsic

pattern of that organ. In the case of the stomach, an ulcer may appear while in the large bowel, ulcerative colitis may become discernible. A man who is tired of battle develops a paralysis—conversion hysteria.

Emotional states of the mind are alleged to reflect upon the tones of the skeletal and visceral muscles. Psychoneurotic fatigue may be due to prolonged hypertonicity which can be abolished by deliberate relaxation. Fibrositis and myalgias are expressions of local tension in neurotic states. An inner current of emotions may also influence "tennis elbow," hysterical torticollis, spasmodic flat foot and many other abnormalities. The psychological mechanism of "tennis elbow" for instance, is based upon long continued spasm associated with the mental concept of clenching the fist.

Rheumatic symptoms may be symbolic of inner tension manifested by stiffness, fibrositis, and myalgias and may be an expression of resentment against an unfortunate circumstance.

Visceral neurosis is capable of producing preulcerative lesions in the gastrointestinal tract, dysmenorrhea, bronchial spasm, dermatoses, and angina pectoris, as well as bone lesions. Although bone is less labile its blood supply cannot escape the deleterious vasospasm with its resulting functional ischemia and hyperemia, and, finally sclerosis osteoporosis, osteo deck atrophy and even Paget's disease.

SAMUEL L. GOWAN, II, M.D.

Steindler A.: The Newer Pathologic and Physiological Concepts of Anterior Poliomyelitis and Their Clinical Interpretation. *J Bone Surg* 1947 29 59.

The interpretation of the clinical features of infantile paralysis has been greatly enhanced by the newer studies in the fields of pathology and physiology.

Since Charcot's time, pathological studies have led to a gradual extension of our concept of the seat of the disease. This concept now includes many parts of the central nervous system, and it is much more adaptable for an explanation of the clinical symptoms and course. The selectiveness of the paralysis and the prevalence of the partial over the total paralysis of muscles suggest a spotty destruction of neurons with mesodermal glial infiltration and cording. The absence of clinical paralysis is due to the scattered distribution of the motor neuron lesions.

The second point of clinical interest is recognition of the reversibility of the anterior horn lesions. Obviously, complete destruction of the anterior horn cells is final and permanent damage, yet up to a certain point the changes seen in these cells must be reversible, just as the inflammatory glial infiltration and the perivascular lymphocytic exudates or cuff are reversible. The following is essentially the sequence of changes in the motor cells of the horn: the chromatolysis, the sharply outlined acidophilic inclusion of the Nissl bodies, and the peripheral arrangement of these bodies, then the loss of cell outline, complete disintegration and crumbling of the

cell followed by satellitosis of the nucleus phagocytosis and, finally gliosis.

The next clinical symptom to be explained on pathological grounds is the spasm. It is now believed that spasm represents a dysfunction of the interneuronal, or so-called internuncial cell group of the anterior horn. There is no doubt that it is a most frequent symptom and that it is entirely different from contracture. During the 1944 epidemic in Iowa, the author found spasm in practically all cases and almost invariably in the quadriceps.

It is not impossible that the symptom of so-called mental alienation represents the loss of voluntary control, a physiological block within the central nervous system and, more specifically in the system of synapses located all the way from the cortex to the cord. While this is recognized as a transitory and reversible stage, it may appear as a real paralysis. In contrast to the changes due to destruction of the anterior horn cells these changes are entirely reversible and may well explain some of the early and remarkably rapid cures.

Studies in physiopathology have been carried on in recent years with the center of interest on the muscle and the neuromuscular junction.

The histological corollary of regenerative ability of the muscle fibers has been studied. Simple atrophy shows a shrinkage of the fiber and apparently an increase of the sarcolemma nuclei; later there is a disappearance, first of the cross striation and then of the longitudinal striation. It is believed that these stages are still reversible. The more advanced changes in the muscle begin with vacuolation, necrosis, and crumbling of the sarcoplasm, proceed to proliferation of the interstitial tissue, and finally to fibrous or fatty substitution of the parenchyma. These latter changes are believed to be irreversible.

Bouman and Schwartz showed in electromyograms that spasm is a general phenomenon in infantile paralysis appearing in the synergist and antagonist alike, and has nothing to do with denervation

of the motor horn. It finds a plausible explanation in the dysfunction of the internuncial cell group, which has lost its inhibitory effect on the spinal reflex mechanism. Spasm does not exist in the totally flaccid paralyzed muscle.

Moldaver emphasized the electroprognostic value of chronaxial measurement. The muscles with only slightly increased chronaxia have a good prospect of recovery while those with prolonged chronaxia or those not responding at all offer a poor prognosis.

The experiments of Hines and his associates showed that the failure of the muscle to develop effective tension is the cause of atrophy; they also found that inactivity and immobilization retard neuromuscular regeneration while a program of early muscle use promotes it. These authors further found that electric stimulation greatly retarded the loss of weight and the loss of strength of the muscle in the period which preceded its reinnervation. Finally they found that not even the resultant fatigue seemed to have an injurious effect on any phase of neuromuscular regeneration.

While these more recent studies in the pathology and physiopathology of muscle and peripheral nerves may not have brought about anything resembling a complete and radical change in the management of anterior poliomyelitis they have produced important modifications in our concepts of conservative treatment.

The rules pertaining to the application of heat and rest and the avoidance of stretch reflexes in the affected muscles are still being adhered to and in addition, during the period of hyperesthesia, all limbs are kept in proper position. Casts are almost never used and braces are applied only to prevent deformity. Weight bearing is allowed as early as possible and recumbency is prolonged only in patients threatened with spinal asymmetry. Early massage and systematic active and passive movement are especially important. Early mobilization favors neuromuscular regeneration.

RUDOLPH S. REICHER, M.D.

SURGERY OF THE BLOOD AND LYMPH SYSTEMS

BLOOD VESSELS

Schroeder E.: Case of Spontaneous Rupture of the Subclavian Artery. *Acta chir scand* 1947 95 17

The author notes that arterial ruptures are rare and that they are usually caused by traumatic injury. The so-called spontaneous ruptures as a rule are due to arteriosclerosis or inflammatory changes in the wall of the arteries.

A report is given herewith of a spontaneous rupture of the right subclavian artery in a sixteen year old boy who died 6 hours after admission to the hospital. In giving blood transfusions to him the veins were found to be strikingly fragile. Post mortem examination revealed a large hemorrhage into the soft parts of the right shoulder. The starting point of the hemorrhage was found to be a rupture of the subclavian artery. The connective tissue and vascular tissues in the veins as well as in the arteries were very hypoplastic.

The rupture is attributable to a combination of a mechanical factor and a disposition to abnormal fragility of the vessels. This new finds support in the literature and in the author's experiments.

The treatment of this injury will consist mainly in ligation as usually there will not be time enough for suturing of the vessel. The rupture is approached through a longitudinal incision and if necessary the clavicle may be divided.

Ligation of the subclavian artery is followed by gangrene of the arm in 4.8 per cent of the cases. It is important to remove the extravasated blood so that the collaterals may develop. According to Leriche and others, the subclavian vein should be ligated at the same time.

HERBERT F. TACHTON, M.D.

Albert F.: Problems in Arterial Surgery. *Edinburgh M J* 1946, 53 6 1

The author summarizes in brief his previous work on post traumatic dystrophy wherein he was able to demonstrate that the origin of all post traumatic physio-pathic disturbances was to be found in the vasomotor reflexes evoked by injuries however slight of all articular and mainly periarticular tissues. He observed that these reflexes persisted in spite of proximal section of the nerves of the limb and of section of the nerve roots and sympathetic chain, but that, on the other hand, they disappear after degeneration of the nerves of the limb they were axon reflexes. While these vasomotor reactions persist after section of all nerves at the base of the limb, blockage of the same nerves by novocain at the same level suppresses them entirely; thus, nerve block with a local anesthetic is not really a physio-logical section, but it functionally puts out of use all the affected neurons as if they were momentarily degenerated. An outgrowth of this experimental

study was the preventive or curative treatment by the infiltration of novocain especially in ankle sprains or joint injuries.

Clinically it has been known for a long time that an arterial injury which is followed by local thrombosis or by any irritation of the arterial wall may cause vasomotor reflex disorders in the corresponding limb which sometimes seriously threaten the vitality of the limb. However, resection of the injured fragment of the artery, or blockage of the appropriate sympathetic ganglia may prevent these reactions and save the limb. Similar disorders can be seen in arterial spasm, spontaneous or traumatic, and infiltration of the nerves or ganglia with local anesthetic or sometimes, the interruption of nerve pathways by spinal anesthesia gives rapid improvement. Intra-arterial injection of the anesthetic is particularly useful when the spasm does not entirely obliterate the vessel.

In order to trace the origin of these reactions the author considered it advisable to obtain an accurate appreciation of the vasomotor reactions which follow a simple lesion, such as obliteration of a main vessel. Thus he observed that (1) compression or simple ligation of a main artery regularly causes not vasoconstriction but marked and prolonged vasodilatation in the corresponding limb (2) this dilatation is still more marked if the vessels have been previously constricted and (3) these vasomotor responses to arterial compression or ligation are absolutely independent of the central and peripheral nervous systems. The main cause of the vasomotor reactions is to be found in the physicochemical modifications of the peripheral blood and interstitial fluids, under the influence of a cellular metabolism impaired by arterial obliteration. The author suggests a clinical application of this vasodilatory phenomenon in (1) post traumatic disorders (2) surgical edema of traumatic origin, (3) traumatic osteoporosis, (4) delayed union of fractures and (5) circulatory disturbances following endarteritis. When used for treatment, arterial compression is done with the fingers of the nurse or the patient himself and is applied to the main artery as high as possible. The degree and duration of the vasodilatation are proportional to the duration of the arterial compression (from 5 to 15 minutes) and to the intensity of the previous peripheral vasoconstriction.

A similar study was conducted in investigating the effects of venous compression, and it was found that there is always a rapid rise in the peripheral pressure following such compression but that the rise is nearly always preceded by a slight fall. However rather than that these two phenomena follow each other it was demonstrated that they actually occur together, the vasoconstriction affects the main arterial tree, the large vessels being slightly constricted and the smaller ones sometimes obliterated, while the

very small ones are dilated. The fall of the initial pressure, after venous compression corresponds to the dilatation of the small vessels which persists despite the secondary rise of pressure. The author states that this arterial vasoconstriction subsequent to venous compression is the mode by which peripheral circulation is improved when a main arterial ligation is necessitated and ligation of the companion vein is done. The arterial ligation causes a steadily increasing fall of peripheral blood pressure because of the vasodilatation it brings about the vasoconstriction produced by the venous ligation brings this pressure back to a more normal level. The main indication for ligation of the companion vein is in cases of very large injuries even with combined arterial and venous lesions when other techniques for inducing peripheral vasodilatation become ineffective. These experimental procedures are offered as a possible mode of surgical therapy in diseases of peripheral vascular origin. EDWARD H. CAMP, M.D.

Sette Junior A.: Primary Thrombosis of the Axillary Vein. A Case of Traumatic Origin (Trombose primitiva da veia axilar. Sobre um caso de origem traumática). *Arch. brasil. med.* 1946 36 361

A case of primary thrombosis of the axillary vein of traumatic origin is described by the author. A woman, aged 31, with a severe toxic infectious syndrome of unknown origin fell on her right shoulder while attempting to get out from her bed. A few hours later she showed a picture of a complete obstruction of the right axillary vein due to thrombosis. Twenty cubic centimeters of a 2 per cent novocaine solution were injected into the stellate ganglion and the first three dorsal ganglia via the paravertebral route. A few minutes after the injection the axillary temperature rose from 99.3 to 100.7 and a myosis of the right pupil developed. A respiratory collapse 30 minutes after the injection did not yield to artificial respiration and intracardiac injections of adrenaline, and the patient died 3 days after the accident from circulatory failure.

The autopsy revealed an obstruction of the venous circulation of the right upper extremity while the arteries were normal in appearance. The histologic examination of the involved axillary vein disclosed a partial disintegration of its endothelium beneath a red thrombus. These findings as well as the absence of inflammatory reaction in the venous wall justified the assumption that the trauma played a significant role in the genesis of the venous thrombosis which was facilitated by the coexisting circulatory stasis and the toxic infectious condition of the patient.

JOSEPH E. NARAT, M.D.

BLOOD TRANSFUSION

Snyder H. E.: Replacement of Blood. *J. Am. Med. Ass.*, 1947 133 310.

The author reviews his experiences in the North African and Mediterranean theaters during World

War II, beginning with the early recognition that although plasma is valuable whole blood transfusions are imperative in the severely wounded.

By January 1944, before a blood bank was in operation blood was being used at the rate of 1,474 pints (224 c.c.) per battle casualty admitted to the hospitals. In the latter part of February 1944 the first blood was delivered from the American blood bank to the Fifth Army Units at Anzio Italy. In the period from January to June, 1944, the consumption rose to 0.5 pint (237 c.c.) per battle casualty admitted. In the next 6 months it rose to 0.666 pint (330 c.c.) per battle casualty, and in 5 months of war in 1945 1.02 pints (483 c.c.) per battle casualty admission was used. It is also interesting to note that in this period the percentage of battle casualties receiving blood rose from 24.3 per cent in January 1944 to 40.6 per cent for the year 1945.

This increased use of blood accounted in a great part for the reduction in mortality. At the same time the use of plasma continued to approximate the figure first attained in the Sicilian campaign when 30.2 per cent of battle casualties were administered plasma. The average amount of plasma given per battle casualty admitted to hospitals likewise varied little from 0.5 of one unit (250 c.c.). These figures are for the use of plasma and blood in forward hospital installations. Usually plasma alone was available in aid stations collecting stations and clearing stations.

The use of large quantities of plasma in resuscitation of a patient prior to his admission to a hospital often rendered the problem of preparing the patient for surgical intervention more difficult. It was used in amounts of only enough to render the patient transportable to the hospital where whole blood might be used.

Many laboratory and clinical observations were made and allow the following conclusions:

Lowered blood volume in the shock of battle casualties is due entirely to the loss of whole blood and not to loss of plasma except in those cases in which there is gross peritoneal or pleural contamination beginning sepsis gas gangrene, a burn, or a crush injury.

When whole blood has been lost whole blood is the replacement medium of choice, particularly when the loss has been large. Of course, there may be other factors such as cardiorespiratory embarrassment which must be managed with the same promptness as is reduced blood volume.

Shock may be divided into four broad categories on the basis of etiologic factors: (1) trauma and hemorrhage alone (2) trauma and hemorrhage plus contamination or sepsis (3) trauma and hemorrhage plus cardiorespiratory embarrassment and (4) trauma and hemorrhage plus contamination or sepsis plus cardiorespiratory embarrassment. In an analysis of 523 casualties in which the immediate cause of death was shock on this basis, 182 belonged in the first category, 120 in the second, 147 in the third, 78 in the fourth, and 2 were undetermined.

On admission of a battle casualty or any wounded person, a rapid complete survey of the situation must be made with the immediate application of the indicated resuscitative measures. Primarily this is concerned with blood replacement, and it is recommended that as much as 1,000 c.c. of blood that is not cross matched may be given rapidly if the blood pressure is not obtainable. The first 500 c.c. may be given in as short a time as 5 to 10 minutes. Once a systolic blood pressure of 70 has been obtained the rate of transfusion should be decreased. Oxygen is also indicated. If a systolic blood pressure of 50 to 60 mm. of mercury cannot be obtained by the rapid administration of 1,000 to 1,500 c.c. of blood, immediate surgical intervention may be required. The transfusion must, of course, be continued under these circumstances.

Observations at operation may dictate the type of further replacement therapy. Abdominal wounds, peritonitis and/or gross contamination of the peritoneum with feces without much blood in the peritoneum call for plasma therapy rather than more blood.

It has been desirable to administer 1,000 c.c. more of blood or plasma after systolic blood pressure approximates normal. This rule applies as well in those cases in which the shock is not of such severity. Whenever possible the blood is cross matched. It is emphasized that the supportive therapy of blood or plasma is continued through a cannula while therapeutic, as well as diagnostic procedures are being completed.

Those patients in whom the systolic blood pressure is 90 or more, and whose pulse rate is a little rapid, but who have wounds of such an extent and number as to indicate impending shock, should

be given a transfusion of 1,000 c.c. of blood prior to surgical intervention.

Further transfusion of whole blood is frequently necessary in the postoperative period, during which all observers have noted the appearance of anemia.

Forward hospitals actively engaged in caring for battle casualties are ideally furnished with blood from a base transfusion unit. Banked group O blood titrated for anti A and anti B agglutinins was found most satisfactory. When the agglutinins are in a titer greater than 1 to 64, the bottle is labeled for group O recipients only. Low titer group O blood, or blood in which the anti A and anti B agglutinins are present in a titer less than 1 to 64, is reserved for group A, group B and A B recipients and for use in emergencies without cross matching in amounts up to 1,000 c.c. All blood was drawn into vacuum bottles containing citrate and topped with dextrose solution as a preservative, and used within 7 days.

The transfusion of whole blood was found to be a most essential measure in the management of battle casualties in the general hospitals in the base, prior to and during the time of reparative surgical intervention. Five hundred to 1,000 c.c. of blood were given daily until normal hematocrit readings were obtained.

In 1944 and 1945 68 patients are known to have died in the Fifth Army hospitals of pigment nephropathy or nephrosis of the lower part of the nephron. In 31 other cases nephrosis contributed to death. It was believed that in the vast majority of instances the transfusion of blood was not the underlying factor but that the condition was due to other factors probably depending on a severe degree of shock over a considerable period of time.

LEROY J. KLEINBAUER, M.D.

SURGICAL TECHNIQUE

OPERATIVE SURGERY AND TECHNIQUE POSTOPERATIVE TREATMENT

Barman, J. M. and Liljestrom, E. Cutaneous Graft from Germinal Epithelium of Follicular Origin (Injerto cutáneo por sembrar de gérmenes epiteliales de origen foliular) *Rev. med. Rosario* 1946 36 67.

The formation and regeneration of the epidermis is a result of the karyokinetic activity of the stratum germinativum which maintains constant reproductive activity. The epidermis lacks blood vessels and lymphatics, nourishing itself with plasma from the vessels of the dermal papilla. Because the follicular pile is formed by an epithelial pocket which covers a dermal depression in the center of the hair, the authors utilized the ends of hair for skin grafting.

If hairs are extracted and the sheaths that cover the ends are deposited over an ulceration, germinal and proliferative units with nutritional elements belonging to them will have been planted. In contrast, grafts of old layers of superficial epidermis may act as foreign bodies for they have no subdermal tissue. A partial necrobiosis results which produces an alteration of the covering epidermis.

Placing of the follicular sheaths over a surface to be grafted is a simple harmless procedure, but efficient in producing normal skin. By planting a sufficient number of germinal units of epithelium, even large areas can be covered rapidly, however it must be borne in mind that only part of them take. Hairs from the same patient or another may be utilized. The skin obtained is elastic and resistant and has been demonstrated histologically to be of a normal constitution. Not only are the areas covered with epithelium, but the formation of scar tissue is prevented. The tissue formed by the follicular sheath becomes skin when planted on a cutaneous surface and has the pect of mucosa when transplanted on mucosa, conjunctiva or glands.

Good results were obtained in 11 patients with the following technique:

With a Pean tweezers a number of hairs are extracted preferably from the periphery of the scalp while with another tweezers the hair is removed and the sheath which is composed of germinal epithelium, is left. This epithelium is deposited on the ulcer and adheres immediately to the base. The ulcer is covered with vaseline gauze or gauze soaked in saline solution and renewed every 24 to 48 hour. In some cases human plasma and topical thrombin was utilized so as to enmesh the germinal epithelium in a retaining film. ARTHUR F. CIRIELLO, M.D.

Homan, J. Venous Thrombosis and Pulmonary Embolism. *England J. M.* 1917 236 196.

In the past decade it has been shown that when autopsies examinations of the legs are thoroughly

made thrombosis is found in the deep veins of the calf in almost 50 per cent of the cases. Much of this thrombosis is terminal and in no sense a cause of death yet it fits in with the clinical experience in calling attention to a process that is observed relatively frequently in the hospitalized patient and one which may readily become a source of embolism.

Thoracic symptoms and signs of pulmonary embolism may be expected in more than 50 per cent of all cases. Pain pleuritic in form and cough combined with hemoptysis are extremely important diagnostically.

Associated symptoms and signs of thrombosis in the legs are elicited with a frequency proportional to the diligence with which they are sought. The subjective complaints are pain accompanied by local deep tenderness particularly on the outer posterior aspect of the lower leg. The objective signs are slight increase (by measurement) of the largest diameter of the calf, an increased firmness or elasticity on compression and a tendency to resist dorsiflexion. Slight cyanosis of the foot may be observed on standing or even on hanging a leg out of bed, and edema on more prolonged dependency.

A recurrence of an increase in the pulse rate and an elevation of the temperature may be observed after these had leveled off following operation or injury. Some degree of circulatory failure may result reflexly from any infarction. The general circulation may react rather violently to the lodgment of an embolus and yet the circulation may readjust itself within a few hours if no further insult occurs.

Röntgen ray evidence of pulmonary infarcts is of importance but films taken in bed usually show poor delineation of the infarct. Not all emboli produce infarction because of the unpredictable efficiency of the collateral pulmonary circulation. Electrocardiography may be pathognomonic soon after an embolus has lodged and is also useful in excluding coronary thrombosis.

The patient under observation for thrombosis should have the calves and ankles carefully measured daily. Instead of being soft and relaxed one calf may feel more firm to the grip of the fingers and be somewhat larger than the opposite one. The muscles may be irritable and deep tenderness may be discernible along the course of one of the major vessels or in the popliteal space. An insufficiently appreciated, but useful proof of deep thrombosis is the presence of a thrombosed area in a superficial vein particularly on the back of the calf. As a rule this thrombosed vein is all the more noticeable because no varicosity is present as an excuse for a local thrombus.

Homan believes that it cannot be too strongly emphasized that the more silent and inidious the deep thrombosis the more dangerous it is and the more apparent the less liable it is to cause embolism.

Basically there is no true distinction between a quiet thrombosis (phlebothrombosis) and thrombophlebitis although the treatment of the two is somewhat different. All thromboses tend to advance in the end toward a femoriliac obstruction.

Among the general run of postoperative patients, one may expect a lower incidence of thrombosis and embolism than is observed in a group that includes cardiac, prostatic, and extremely sick and elderly individuals. The age grouping is the most important since embolism especially the fatal variety begins to be seriously threatening only in late middle and advanced age. In patients committed to bed by operation accident, and serious illness thrombosis may be encountered often, and emboli in the mild or serious form should be expected to occur fairly frequently in the early stage of thrombosis. These considerations form the basis for prophylactic and definitive treatment.

The first aim of prophylactic therapy is the resumption of normal activities if these are interrupted. Early ambulation tends to restore physiologic normality. It is, however, not fully protective because quiet thrombosis may occur without known cause in everyday life even in young persons. Important is the sitting or reclining position in bed while the legs are relaxed should be avoided; the legs must be actively exercised. Elevation of the foot end of the bed favors a return circulation and avoids venous stasis.

Heparin and dicoumarol may be used prophylactically. Heparin acts directly on the blood delaying coagulation. Its effect is noted by the degree to which the clotting time is prolonged. Dicoumarol acts in the liver to prevent prothrombin formation (prolongation of prothrombin time).

Vein interruption (bilateral femoral vein ligation or section) may be employed prophylactically in patients over 50 years of age as part of the preparation for operation for cancer, prostatism, and serious disorders, particularly when several stage operations are contemplated, and in the treatment of fractures of the lower extremities requiring immobilization and prolonged treatment. The femoral veins are interrupted distal to the profunda branch because at this level protection against embolism is secured without noticeable disturbance of the venous return.

Definitive treatment by means of the employment of anticoagulant drugs is favored at present but surgical interruption of the venous tree at various levels has a fascinating definiteness. Those who employ anticoagulant therapy for established venous thrombosis with or without pulmonary embolism believe that it controls further detachment of the thrombus and also prevents thrombosis secondary to the presence of emboli in the pulmonary vessels, and thus favors healing of the pulmonary infarct. Extension of many thrombi into the popliteal and femoral veins is prevented by the preservation of the useful valves of those vessels. Anticoagulants are indicated in the treatment of established thrombosis when the conditions calling for treatment are neither continuing nor recurrent in thrombosis occurring in

active life in early postoperative and postpartum processes and in thrombosis associated with any severe brief illness including coronary infarction. When embolism has already occurred at any stage of thrombosis the anticoagulants may still be used, although surgical interruption is probably to be preferred.

Surgical interruption of the veins, if ideally performed, ends all danger of embolism. Its success depends on early diagnosis and the exact localization of the thrombus. The disadvantage of the operation resides in the production of a sudden venous obstruction at the common femoral bottleneck, especially when many deep veins in the lower leg and thigh already are more or less occluded by thrombosis. The collateral pathways adequate in early local thrombosis are decidedly insufficient. If the femoral vein is ligated distal to the profunda branch, thrombosis may occasionally short circuit the obstruction with a fatal outcome. Another disadvantage is that the operation throws out of function the important valvular system of the femoral vein, and a considerable readjustment of the venous circulation is then required.

In spite of these objections, bilateral interruption of the femoral vein should be performed in all cases when anticoagulants cannot be given with proper controls and operation is a preferred alternative to the use of anticoagulant drugs when thrombosis has advanced into the thigh, especially when embolism has already occurred. The most preferred level of section is proximal to the profunda. Detachable thrombi higher up (common iliac veins) can be sucked out with the aid of a smooth glass tube introduced into the severed common femoral vein. Some surgeons utilize this surgical procedure even when bilateral thrombophlebitis is present.

Interruption of the common iliac veins is used for recurrent or persistent processes believed to be confined to one leg.

Ligation of the vena cava is performed as a last resort in the presence of otherwise uncontrollable embolism, especially when the causal thrombosis is bilateral and/or unlocalizable.

Homans emphasizes that an operative procedure should be utilized only when it is fully understood what the particular operation may be expected to accomplish. With more experience more definite indications for the use of surgical or chemical methods of preventing and treating thrombosis in the veins of the lower extremities will be available.

ROBERT TURELL, M.D.

ANTISEPTIC SURGERY; TREATMENT OF WOUNDS AND INFECTIONS

Fabian A.: Hand Injuries from the Ironing Machine (O poranek rukožehličnim strojem). *Lit* 1947 2 9.

Ten cases of mangle injury have come under the author's attention. Of these 4 were so slight as to require no special treatment and no disability re-

sulted. The remaining 6 were of a more serious character; however, in only 2 was the use of the hand seriously compromised. There were no amputations. Seven photographic reproductions are given in the original article.

The seriousness of these injuries is ascribed to 3 factors: the weight of the upper roller (30 kgm.) its heat (165-180 C.) and finally the desperate attempts of the victim to free his hand by force. In every case the accident could be ascribed to the carelessness or inattention of the injured person or to lack of adequate experience in the manipulation of the heavy machine. There is a rod extending in front of the rollers as a safety device and this rod is also intended as a means of stopping the machine; however it is frequently necessary to smooth out the material about to be put through the mangle and it is during these manipulations that the hand is apt to become entrapped.

As treatment, the author first removes the hanging tatters of burned skin and then applies a dressing of 10 per cent tannin saline putting the hand and forearm up on a splint. When the burned tissues begin to slough away and suppurate, eubasin powder is applied and the saline changed to unguentum oleum jecoris aselli the dressings being changed twice weekly. Treatment with this unguent results in rapid dissolution of the tags of necrotic tissue and vigorous granulation. The necrotic portions of skin and ligament are carefully removed to avoid starting bleeding. Finally during the period of epithelization a change is made to a 5 per cent rivanol saline.

JOHN W. BAKERMAN, M.D.

Cope, O., Langobir, J. L., Moore, F. D., and Webster, R. C., Jr.: *Expedient Care of Full Thickness Burn Wounds by Surgical Excision and Grafting*. *Ann. S. S.* 1947 135.

Full thickness wounds of the skin have always presented a challenge to the surgeon. Invariably in the patient has languished interminably in the hospital before successful closure has been achieved and if the wounds were extensive the patient has suffered from severe malnutrition.

If the challenge is met by prompt surgical excision of the dead tissue and immediate closure of the wound by grafting infection is precluded, scar tissue with disfigurement and disability are minimized, the period of hospitalization is curtailed, manpower economized and the outlook of the patient heartened.

The expeditious treatment of 32 full thickness burn wounds in 38 patients by surgical excision and grafting at the Massachusetts General Hospital, Boston is recounted. Circumscribed burns of full thickness have been excised and closed by grafting within a few hours after injury; the healing is most gratifying. In wounds in which a delay of a few days between injury and excision was introduced infection ensued itself in spite of the administration of systemic chemotherapy and delayed closure was resorted to in half the cases. The results have been surprisingly good. In the patient with full thickness wounds,

homeostasis has been effected and maintained so that areas have been excised and grafted within a few days. The care of the other areas has had to be postponed because of the precariousness of homeostasis and lack of sufficient donor skin for grafting. The longer the delay in closure the greater has been the infection, the less successful the take of the grafts, the uglier and more disabling the scarring.

It is hard to convince any but the plastic surgeon with his experience in excising old scars, that the best base upon which to place a graft is the one freshly exposed, even if edematous, after excision of burn slough.

The problem of full thickness destruction resolves itself with experience in practice.

Chemotherapy is a valuable adjunct in holding in vasive infection in abeyance in those cases in which the excision and grafting must be delayed and in which the organisms are amenable. Its services are probably superfluous in those patients whose wounds are excised and grafted within a few hours after injury.

JOHN J. MALONEY, M.D.

Harvey, E. N., Koer, I. M., Oster, G., and McMullen, J. H.: *Secondary Damage in Wounding Due to Pressure Changes Accompanying the Passage of High Velocity Missiles*. *Surgery* 1947 31: 318.

Primary damage in wounding results from direct crushing of tissue in front of the moving missile and from stretching and tearing in a wide region around the path of the missile. The stretching results from the formation of a large temporary cavity behind the missile which leaves a region of extravasated blood on collapse. The cavity formation is explosive in character and a comparison is drawn between a shot into tissue and an under water explosion.

Secondary damage occurs only if gas is present and results from the effect of pressure changes accompanying the passage of a missile through tissue on the gas. The pressure changes are of three kinds: (1) shock wave pressures that originate when the missile strikes and that move through tissues with the velocity of sound in water; (2) a high pressure region around the moving missile; (3) pressures, both positive and subatmospheric, connected with the behavior of the temporary cavity.

The events which occur during a shot into a tank of water are similar to those in tissue. Hence an analysis has been made of the cause of damage by suspending tissues or organs in salt solution and shooting among them. Blood corpuscles, frog hearts, and intestinal loops were used. Several high speed motion picture frames and spark shadowgrams illustrate these events which are analyzed in detail.

Damage occurs in gas-free organs only if the tissue is severely stretched by movement of the temporary cavity. When gas is present in an organ secondary damage results from expansion of the gas as a result of the subatmospheric cavity pressure. The expanding gas pocket stretches tissue in a manner quite similar to that of the temporary cavity. Fish in water are sensitive to damage from gun fire or detonation because of their swim bladder.

The high pressure of shock waves resulting from the impact of missiles does not appear to cause damage rather it is decreased pressures that are destructive. Such decreased pressures occur when a shock wave is inverted by reflection from an air surface in this case the low pressure shock wave can cause damage. Injury to men in under water blast probably results from the reflected wave.

JOHN E. KIRKPATRICK, M.D.

Rosenfeld L.: Delayed Suture of War Wounds. *Surgery* 1947 21: 200

With the exception of débridement delayed closure of wounds was the operation most frequently performed in military surgery of World War II. Its importance therefore in hastening convalescence and expediting the return of the wounded soldier to duty cannot be overemphasized.

The present report deals with an analysis of 666 wounds occurring in 315 patients in which a delayed closure was performed. The patients were treated in a general hospital in Italy from November 1943 through May 1945. The cases presented include all of the wounds secondarily closed in one general surgical ward in this hospital. In addition to the general surgical type of patient there were also the maxillofacial and plastic cases and a considerable number of chest cases. Very few of the patients in the first two categories required this procedure, the greater portion of the face wounds having been closed in the forward hospitals whereas, in many of the chest cases, delayed closures were required. In addition to the wounds in which delayed closure was accomplished there were numerous wounds in which closure was not feasible and either partial or complete coverage with split skin grafts was required, and such cases are not included in the analysis. The results obtained in this one ward are fairly typical of the results obtained in 15 other surgical wards in this hospital.

The wounds are divided into two groups: those in which primary union was obtained and those in which, following secondary closure, some wound complication resulted. The wounds with complications may be subdivided into the following 5 groups: (1) cellulitis with purulent exudate, (2) cellulitis without purulent exudate, (3) hematomas, (4) severe stitch abscesses, (5) partial or complete wound separation.

The author has been rather stringent in the definition of the last group. He considered any wound in which the wound separation measured 3.0 cm. or greater in length to fall in this class. Of the total number of 666 wounds 96 or 9.9 per cent fell into the group of wounds with complications.

The observed facts substantiate the supposition that following adequate débridement early secondary suture of the debrided wound is a highly satisfactory procedure. The facility with which wounds can be closed at this early date has been mentioned. It is important that, barring complications, the original dressing not be disturbed until the patient is on

the operating table. The importance of immobilization postoperatively cannot be overemphasized and the author believes that bed rest the first week is a definite adjunct.

The factor of primary importance which has been kept constantly in mind is that of early mobilization and restoration of function in order to hasten the return of the patient to useful duty in this theater. No attempt was made to discuss special problems which pertain to wounds in specific localities, such as the face and hands. Needless to say these two sites withstand closure under tension very poorly.

The suture should be small in caliber. Sutures in the face and neck have been removed in from 3 to 5 days and sutures in the hand usually on the fifth day without wound disruption. The most difficult sites of closure were the long shoulder and scapular wounds so frequently and unfortunately longitudinal in direction, often of considerable length, up to 30 to 40 cm. and with considerable loss of substance. Transverse wounds in this locality close much more readily whereas on the extremities except in the vicinity of the joints the longitudinal wound lends itself most readily to closure.

The scars resulting from these closures frequently leave much to be desired. With no fascial closure, and the wounds often sutured under tension the scars frequently broaden and after a period of 6 to 12 months some scars have been seen to be quite wide. Although muscle hernias frequently occur the author has only rarely observed one which was the cause of pain and dysfunction. Doubtless, in the years to come many of these scars will require excision. For the present, however, the method used suffices as a means of securing early closure of the defect with epithelium, early return of function, and rapid rehabilitation of the patient.

JOHN E. KIRKPATRICK, M.D.

Mansfield O. T.: The Excision and Repair of Deep Thermal Necrosis. *Brit J Surg* 1945, 34: 21.

The surgical excision of tissues irreparably damaged by heat has been advocated for a considerable time but the method has several limitations which may have prevented its practice in suitable cases.

In theory the sooner a devitalized area is separated from its host the sooner will surgical repair be practicable and the shorter the stage of toxic absorption from the infected slough. This is generally accepted, but the corollary of this statement is that, whenever possible, excision of the entire area should be carried out before proteolysis occurs, and should be immediately followed by primary repair. In most cases, such repair can be adequately effected by split skin grafts provided these will have a vascular bed for their reception, exposed tendons or cortical bone for example cannot support any thickness of free graft whatsoever, their failure over such areas will result in further infective necrosis.

If primary excision is to be practicable the following conditions must be fulfilled: (1) the area of necrosis must be capable of total excision; (2) the area to

be excised must not be surrounded by an area of partial thickness skin loss and (3) facilities for immediate repair of the area must be available.

The author presents a case in detail, to illustrate this active approach in the treatment of thermal necrosis.

HARRY W. FRIED, M.D.

Jezek, K.: Contribution to the Chemotherapy of Thrombosis of the Cavernous Sinus (Příspěvek k chemoterapii trombózy sinu kavernózního). *Lit. listy* 1947 2: 35.

Pessimistic authorities have in the past regarded any claimed cures of thrombosis of the cavernous sinus as the result of faulty diagnoses rather than of therapeutic efficacy. They believed that the diagnosis could not be definitely established during life and could be verified only at the autopsy table. The author regards both these postulates as too radical. He has hopes for better results with the new therapeutic agents (sulfonamides and penicillin) and believes that a fairly reliable diagnosis of the condition can be established during life.

The diagnosis is fairly well established in the presence of bilateral edema of the lids, conjunctival chemosis, and exophthalmos developing on the basis of a unilateral septic focus of the face. The diagnosis is further confirmed by oculomotor paresis and involvement of the first branch of the trigeminal nerve, although they may be limited to one side only, and accompanied by a septicopyemic picture (blood picture, blood culture, evidence of metastasis to the lungs). The correctness of the diagnosis will be supported by eyeground findings of congested and tortuous veins, various degrees of loss of visual power and evidence of meningeal irritation. When all the findings are limited to one side the process may be limited to the one orbit or it may have reached the cavernous sinus on that side, but it has not yet involved the other side through the inter-cavernous sinuses.

The author reports 2 cases in which the diagnosis of thrombosis was established by the discussed criteria.

One patient was a young man who had cut a furuncle on the lower lip while shaving, and the other a child of 12 years who had had a carious tooth extracted by a dentist. In both instances the process was far advanced when it came under the author's care, and in both large doses of both sulfadiazine and penicillin were started. After about 3 days of such treatment the mental state of the patients began to clear up, their eyesight improved and their entire condition gradually resolved. Altogether the young man received 900,000 units of penicillin intramuscularly and the child 940,000 units intralumbally and intramuscularly. The final result was complete recovery without sequelae of any kind in both instances.

No conclusion is drawn from these 2 cases, however, they are offered with the thought of having them included in future collected series of such cases.

JOHN W. BRENKIN, M.D.

Putaski, E. J., and Sprinz, H.: Streptomycin in Surgical Infections; Laboratory Studies. *Ann. Surg.*, 1947 125: 194.

It is well established that successful clinical results from antibiotic therapy depend on accurate bacteriologic diagnosis and proved susceptibility in vitro of the causal organisms to the chemotherapeutic agent.

Research on the clinical effectiveness of streptomycin in certain types of infections afforded the opportunity of making correlative laboratory studies.

A broth serial dilution method was devised which consisted briefly in determining the lowest concentration of streptomycin which will produce complete inhibition of growth of the organism to be tested. Sixteen to 18 hours were used as the incubation period and controls were established with a staphylococcus aureus of known susceptibility.

The sensitivity test has been adapted to the assay of streptomycin in the blood and urine. These substances were serially diluted in the range of from 1:1 to 1:32. The urine was first diluted with 20 parts of distilled water because of the high concentration usually present.

Two cubic centimeters of a 1:50 dilution of a 6 hour culture of the test organism in broth were added to the tubes containing the serially diluted body fluid being assayed. Results were read after incubation for from 16 to 18 hours. Controls were established using pretreatment urine and blood and diluted them in the same manner.

The absorption of streptomycin after intramuscular injection was observed to reach the maximum concentration within 30 minutes; this lasted about 3 hours. The drug was rapidly excreted in the urine and, after oral administration in the feces, the rate was slower than the reported rate for penicillin. The effective dose seemed to be 0.4 gm. given by the intramuscular route every 4 hours.

Streptomycin was recovered from the bile at autopsy and from T tubes in one-quarter the concentration present in the blood serum.

Pericardial fluid, pleural transudate, and ascitic fluid contain from one-quarter to one-half the concentration in the blood serum. Streptomycin does not diffuse readily from the blood stream into the cerebrospinal fluid.

Traces only reach the prostate and this seems to explain failure in the treatment of chronic lesions of the prostate due to susceptible organisms, even with relatively large doses of streptomycin administered parenterally.

Pus obtained from thick walled abscesses in 4 cases contained no streptomycin. Thus, parenteral administration of streptomycin will neither sterilize nor cause abscesses to disappear. Streptomycin activity is not influenced by pus except mechanically.

The susceptibility of bacteria to streptomycin was tested. The mean blood serum level of 16 microgram per cubic centimeter which is maintained by the intramuscular injection of 0.4 gm. every 4 hours was the basis for the classification of gram-negative bacteria as follows:

Inhibition by 4 mcgm./c.c. streptomycin—very sensitive.

Inhibition by 16 mcgm./c.c. streptomycin—sensitive.

No inhibition by 16 mcgm./c.c. streptomycin—in sensitive

No inhibition by 128 mcgm./c.c. streptomycin—resistant

This classification also applies to infections of the genitourinary tract despite the fact that streptomycin is excreted in high concentration in the urine. Experience showed that bacteria that grew in a concentration of 16 mcgm./c.c. were rarely eradicated from the urine.

The many organisms studied showed a wide variance in susceptibility to streptomycin and showed the need for testing organisms before streptomycin therapy was used.

A comparison of susceptibility of 250 strains of cocci positive to both penicillin and streptomycin was made. In general, organisms resistant to penicillin were susceptible to streptomycin, and vice versa. There may be some value in giving both drugs because subinhibitory amounts of streptomycin and penicillin combined are cumulative in effect.

Dosage principles were derived from these studies.

Doses of 0.5 gm. of streptomycin administered intramuscularly every 4 hours maintained blood serum levels in excess of 16 mcgm./c.c.

There is no evidence that additional benefits accrue from doses in excess of 3 gm. a day administered parenterally regardless of the type and severity of the infection.

The anatomic location of the lesion and the concentration of streptomycin attainable at the site govern the dosage and mode of administration.

Local administration is necessary in the treatment of infections of the ear, meninges, brain, pleura, trachea, and bronchial tree. The dosage employed is from 50 to 250 mcgm. dissolved in an appropriate amount of sterile isotonic saline solution.

Oral administration is required for intrauterine infections. A dosage of 1 gm. every 8 hours in water is optimum.

Drug fastness developed rapidly even in bacteria that were susceptible. This occurred most commonly in the treatment of urinary infections. Once drug fastness occurs, it is irreversible and drug fast bacteria produce drug fast bacteria. The change is specific and does not indicate concomitant resistance to other chemotherapeutic agents.

EDWARD R. DOMAGUE, M.D.

Zint J. H. A. Wyle, M., Nichols, A., and Rhonda, J. E.: The Use of Streptomycin in Surgical Patients. *Surgery* 947 31 175

In the treatment of infections caused by gram-negative bacteria, streptomycin promises much the same therapeutic effectiveness that penicillin has manifested in the treatment of infections caused by the gram-positive organisms. It remains to be demonstrated whether or not this impression gained

from in vitro experiments is confirmed by clinical experience. Although streptomycin is effective in the treatment of certain gram-positive organisms in general its effectiveness against these organisms is not as great as that of penicillin. Data which the authors wish to summarize have been obtained by a group of individuals working on several phases of this problem at the University of Pennsylvania, Philadelphia.

Streptomycin first described by Waksman and associates is obtained from cultures of *Actinomyces griseus*. Thus, 1.0 gm. is equivalent to 1,000,000 units, a moderate daily dose.

Studies of the acute toxicity of streptomycin indicate that it is definitely more toxic than penicillin. Nevertheless the margin of safety between the therapeutic and a definitely toxic dose is wide. Acute toxic symptoms such as palpitation, headache, flushing of the skin, arthralgia, and delayed fever often occur at dosage levels of 4.0 to 5.0 gm. per day when given in divided doses intramuscularly and tend to limit the dosage to less than 4.0 gm. per day. No evidence of toxicity has been noted following oral administration.

Streptomycin is widely distributed in body fluids, except spinal fluid, after parenteral administration, but apparently it does not readily cross the wall of the alimentary tract. Hence, it should be given orally if it is to influence the flora of the feces.

It is effective in many urinary tract infections of both gram-negative and gram-positive organisms that have failed to respond to penicillin and sulfonamides but not in all. It has, perhaps, a special field of usefulness in infections due to *Bacillus proteus* and *Bacillus pyocyaneus*.

It has exerted a beneficial influence on the course of experimental peritonitis in dogs. The difference was statistically significant when combined with an earlier group of experiments in a laboratory. The therapeutic effect, however, was not as great as that with a combination of sulfonamides and penicillin.

Streptomycin appears to be a very effective agent in reducing the bacterial count in the stools. It reduced the coliform organisms to a greater degree than *saccharin*, *salicylic acid*, and reduced the *Streptococcus fecalis* and *clostridia* to a much greater extent.

JOHN E. KIRKPATRICK, M.D.

Kloosner A. R. Treatment of a Case of Noma with Penicillin (Ein mit Penicillin behandelter Fall von Noma der Wangen). *Ann. Chir. Gyn. fenn.* 946, 35 5

Following the extraction of a tooth, a case of noma occurred in a 17 year old girl. On transfer to the surgical department, this undernourished patient was found to have a severe secondary anemia. This condition was accompanied by a necrotic, foul smelling ulcer (about 4 by 5 cm.) involving the left cheek. The lesion was sharply demarcated from the normal buccal tissue by an edematous, parolled appearing border. Irritation of this lesion elicited no bleeding.

Treatment consisted, first, of the application of neosalvarsan and sulfathiazole powder for 3 days, without healing. After this penicillin was administered in doses of 10,000 units every 4 hours until a total of 270,000 units had been given. Within 24 hours after the penicillin was first given, healing was apparent and the foul odor had decreased. The patient was discharged from the hospital approximately 18 days later with a healed fistula in the cheek through which the teeth were visible. Three months later the patient was seen again and at that time there was a healed scar at the site of the previous perforation.

The discussion of this case includes a complete historical review plus a résumé of the important contributions to the literature on this subject.

SAMUEL J. FOOTLICKSON, M.D.

ANESTHESIA

Mazzola, V. P.: Sodium Pentothal Anesthesia in Major Obstetric and Gynecologic Surgery. *Am J Obst* 1947 53 207

The use of intravenous sodium pentothal anesthesia in 300 consecutive major obstetric and gynecologic cases is reported. There were 50 obstetric cases consisting of 45 cesarean sections and 5 cesarean sections with supracervical hysterectomy. The gynecologic cases were divided between major vaginal and abdominal procedures. The continuous method of intravenous administration of sodium pentothal is advocated, with 2 per cent, 1 per cent and 0.5 per cent solutions. A dose of less than 1.5 gm. of sodium pentothal was used in this series. No maternal or fetal deaths and no postoperative complications were encountered.

Sodium pentothal intravenous anesthesia can be used with success in major obstetric and gynecologic surgery. It is a safe anesthetic for its dangers are minimal in the hands of a competent properly trained anesthetist. In cesarean sections the precaution should be taken that the baby is delivered within 5 minutes of the injection. This anesthetic is of advantage because the injection is pleasant and simple and the induction is rapid and easy in that the patient falls asleep and quietly passes into the stage of surgical anesthesia. Dosage is easily controlled. Recovery is rapid and without vomiting or distention. It is excellent for debilitated and aged patients.

It is contraindicated in advanced cardiac disease with dyspnea, toxemia, and obstruction of the airways. Sodium pentothal does not give good relaxation for extensive abdominal procedures, but it can be supplemented by other methods.

JOHN R. WOLFF, M.D.

Ericsson, N. O.: The Frequency of Complications, Especially those of Long Duration after Spinal Anesthesia. *Acta chir scand* 1947 95 167

Spinal anesthesia appears in an increasing degree to fulfill the needs of a satisfactory form of anesthesia

that has few or no contraindications. The author has studied the existing literature and has examined the records of 784 cases in which spinal anesthesia was used, to acquaint himself with the risks and postanesthetic complications in this connection. The substances used were perocaine (1 to 1,500) and novocain in 5 per cent solution. In only 1 patient in the author's series (with hematomyelia which resulted in death) did anesthesia appear to be the deciding factor.

Nervous symptoms from the anesthetized zone were in the form of paresthesia in 9 per cent of the cases in the author's series, and the longest duration of symptoms was 6 months. No marked cauda equina syndrome occurred. Paresis of the bladder occurred in 17 per cent of the cases with a maximum duration of 10 days. The possible etiology of these nervous symptoms was that of a toxic injury caused by the anesthetic substance.

Nervous symptoms outside the anesthetized zone occurred more frequently than those inside the anesthetized zone, and included such symptoms as diplopia (in 3.3 per cent of the series) and paresis of the upper extremities (in 2.5 per cent of the series) which in 0.9 per cent persisted for more than a year.

Headache is unquestionably the most common sequela and is said to occur in from 10 to 25 per cent of cases. It can last as long as a year and the author states that it has occurred in from 12 to 25 per cent of cases following ordinary lumbar puncture. In his series headache was of short duration in from 10 to 13 per cent of the patients, in from 5 to 9 per cent of patients the headache was of more than 1 week's duration and in 0.3 per cent, headache was present for over 1 year. It is assumed to be due to spinal fluid hypotension which arises through a leakage of spinal fluid, caused by disproportion between the arterial and spinal fluid pressure, and bringing with it an increased stretching of the arterial walls of the cranium. A nervous constitution with predisposition to headache is considered to be responsible for headache of long duration. Ergotamine tartrate is suggested as a therapeutic measure.

Nausea and vomiting, though less common after spinal than after inhalation anesthesia, were possibly of somewhat longer duration. Vertigo was of short duration and relatively insignificant. Backaches occurred in from 3 to 22 per cent of cases in the literature and in 3 per cent of the patients in the author's series most often after gall bladder operations due possibly to overstretching of the spinal muscles. The fall in blood pressure during spinal anesthesia had no relation to the late symptoms. Repeated spinal anesthesia at short intervals did not increase the risk or frequency of postoperative complications.

Sixty nine per cent of patients were entirely free from discomfort after perocaine anesthesia, 21 per cent had slight discomfort, and 10 per cent had severe discomfort. After novocain anesthesia the figures were 80, 15 and 5 per cent respectively. The patients who were given perocaine had undergone a

greater number of major operations and it was believed that there was no significant difference in toxicity between the percaline and novocain. The quantity of anesthetic substance used played no role in the causation of the discomforts.

Examination of the 784 cases was accomplished by means of a carefully specified questionnaire which was sent out during the period between 1942 and 1944. It was based on the answers which were received in 784 of 1,206 cases. These answers together with the case returns and anesthetic records have served as the basis of the investigation. The post-operative complications have in practically every case been subjective. Personal examination has shown the complications in some cases to be due to other than anesthetic causes.

The opinion as to contraindications has been revised during the past few years. In the case of cardiac defects, arterial hypertension, or a poor general condition in patients who, as a result of their illness, are poor risks, spinal anesthesia should, in the majority of cases, be the most lenient form of anesthesia, especially in major abdominal operations. Shock presumably should be a contraindication for spinal anesthesia. During pregnancy sensitivity to spinal anesthesia should be an indication for certain restraint and increased cautiousness. Patients with a history of earlier neurological disturbances present certain risks if spinal anesthesia is to be used, and each case of this type should be individualized. Spinal anesthesia has gained an increasingly wide field and should be the ideal form of anesthesia in many operations such as ileus, peritonitis, icterus, and uremia.

The disadvantages of spinal anesthesia are discussed—particularly the occurrence of certain late symptoms must be counted as a definite disadvantage—but compared to the advantages, these drawbacks are believed to be small. It is pointed out that other forms of anesthesia also occasion late discomforts, although these have not been observed and discussed to the same degree. MARY KARP, M.D.

Voylatsko, G.A.: Pseudomonas Pyocyanea Meningitis after Spinal Anesthesia. *Brit M J* 947 79

Reports are presented of 4 cases of Pseudomonas pyocyanea meningitis, 3 of which were of the melanogenic variety. Three of these received intensive sulfonamide treatment by mouth. The fourth had a rapidly fatal issue, and was erroneously given penicillin and only medium doses of a sulfonamide. One of the patients with true Pseudomonas pyocyanea meningitis survived after intensive sulfathiazole treatment 740 gm in 92 days. Pyocyanea meningitis is considered very rare and possibly always of traumatic origin. The patients in the 4 cases recorded had had spinal anesthesia under scurocaine. An aseptic technique is considered important in the prevention of this condition.

The meningitis that occurs is very resistant to treatment early and intensified sulfonamide therapy

is suggested and should be maintained because of the frequency of relapses. Of the 4 cases reported 3 terminated fatally after operation while the fourth case was cured.

MARY KARP, M.D.

Richards, R. K.: Effects of Vitamin C Deficiency and Starvation upon the Toxicity of Procaine. *Current Res Anesth.* 947 26 2.

It was found that vitamin C depleted guinea pigs developed a markedly increased sensitivity to pentobarbital indicated by a prolonged sleeping time. This drug is subjected to destruction predominantly by the liver. Fatty changes in the liver which occurred in these animals were not responsible for the impaired ability of this organ to destroy nembutal, but vitamin C itself was probably involved in the process.

Among other drugs, which are largely metabolized by the liver are most of the local anesthetics. Hepatic damage is known to retard greatly the destruction of procaine. It was considered desirable to investigate the effect of this nutritional deficiency upon the toxicity of procaine.

It was observed that variations in the diet which impaired the vitamin C supply greatly influenced the sensitivity of guinea pigs to procaine. If 300 mgm/kgm were given as little as 15 minutes prior to the procaine, restoration of normal sensitivity followed in animals depleted for 15 to 21 days. It was shown that the greater sensitivity of these animals was due neither to the lowering of glycogen stores in the liver which usually occurs in vitamin C deficiency, nor to the frequently increased fat content in this organ.

A comparison of the incidence of convulsions in starved animals with that of guinea pigs on a vitamin C free diet shows a similar increase of sensitivity for the two groups. Dextrose in liberal amounts restored normal sensitivity ascorbic acid was likewise effective.

Even moderate changes in the supply of vitamin C affect the tolerance to procaine, and general starvation equally lowers resistance. Evidence is given for the possibility of increasing the tolerance to this drug by giving an extra supply of dextrose and vitamin C to animals in the so-called normal nutritional state.

The results of the experiments suggest that liberal administration of dextrose and vitamin C prior to the use of large doses of procaine may increase the resistance against toxic side effects of this drug, particularly in patients in a poor nutritional condition.

MARY FRANCES FOR, M.D.

Crossman, L. W., and Allen, F. M.: Surgical Refrigeration. *J Am M Ass* 947 35 377

A dead limb which for some reason cannot be amputated at once can be preserved by refrigeration to prevent a rapidly fatal intoxication. Interesting case reports representing such situations are presented. One of the patients refused surgery but was kept without pain or toxic symptoms for 6 weeks,

after which time she died of her original cardiac ailment. Another patient, who was chronically undernourished, had a bilateral femoral thrombosis when admitted with but little chance of survival. After 10 days of refrigeration of both legs to the groins, her general condition had improved sufficiently to tolerate surgery safely.

A bad general state of the patient is the usual reason for wishing to delay surgery, but also there is the hope that a lower level of amputation will be possible. With refrigeration anesthesia no tourniquet is needed except briefly at the final amputation. Limbs may be packed in ice while waiting for the legal permission for the necessary amputation. This allows a safe postponement of the operation for several days and at the same time decreases the operative risk.

A still better result occurs when the refrigeration not merely tides over an emergency but prevents amputation altogether. An accident case is cited in which only minimal instead of the usual extensive débridement of badly injured extremities was necessary after refrigeration for 2½ weeks. Refrigeration permits saving the whole of the living tissue, which may be partly sacrificed by the usual débridement.

Reference is made to a previous report which showed that refrigeration aids in restoring fingers which have been cut off so as to hang by a mere

thread of skin. A patient can pack an injured finger in ice and so keep it viable for several hours, should such a time interval be necessary before he can reach a doctor. After the finger is sutured in place the reduced temperature is still continued for several days but it is raised slightly day by day as the nutrition of the severed part returns.

Mention is made of the experimental work of Blakemore and his coworkers in which amputated legs of dogs were kept refrigerated for 24 hours and then replaced with successful healing. If a limb is fairly cleanly amputated in an accident, there is a challenge to any physician to pack such a part in ice and send it along with the patient to a hospital equipped for the necessary anastomosis.

Refrigeration permits application of a tourniquet for much longer periods and with much less harm than when it is not used. In 1 instance a tourniquet was left in place for 27 hours on a refrigerated limb. There was no detectable change either in the zone of the 27 hour pressure or proximal or distal to it.

Cold has the unique ability to inhibit simultaneously pain, shock, infection, toxic absorption, and tissue devitalization. Experiments show that body temperatures of 80° F. or lower are not so effective as the near freezing temperature, however, their inhibition of shock is nevertheless striking.

EDITH EASON, M.D.

PHYSICO-CHEMICAL METHODS IN SURGERY

ROENTGENOLOGY

De Castro J M: Fundamental Principles in the Application of Cineroentgenography as an Auxiliary Method to Roentgen Diagnosis. *Am J Roentg* 1947 57 103

The author states that cineroentgenography has been made adaptable to daily use. A 35 mm film is now being used and is superior to a 16 mm film. Practical reasons for the use of cineroentgenography are: (1) a sharp roentgenogram serves as a document of the fluorescent screen; (2) a more careful study of the projections may be made at the leisure of the roentgenologist and other doctors; (3) objective and mathematical studies may be made as a result of tracings. The last method has been termed 'roentgenological chronocinematography' which is a roentgen documentation of the movement of an organ in relation to time.

Cineroentgenography especially in group studies will undoubtedly aid in establishing diagnoses which could not have been made by ordinary roentgen means.

Excellent reproductions are shown of studies of the passage of barium in the gastrointestinal tract; the heart; the mechanics of movement in a patient with congenital pseudarthrosis of the tibia and fibula; and the mechanics of the normal movements of a hand.

MACCRACK D SACRE, M D

Teplick J G., and Drake E H: The Roentgen and Cardiac Manifestations of Funnel Chest. *Am J Roentg* 1946, 56 7

Funnel chest or pectus excavatum, has received only scant attention in the medical literature although it is not a rare condition. The majority of the cases exhibit no symptoms.

The authors report 9 cases of funnel chest which were studied roentgenographically. Several of the patients complained of palpitation and dyspnea especially following exercise but they had not had a serious cardiac embarrassment.

Funnel chest is a developmental anomaly. In 4 of the authors' cases it was of a hereditary nature having occurred in one or more members of the patient's immediate family. In another case it was the result of severe trauma to the sternum which produced an angulated fracture.

The most characteristic roentgen finding is a displacement of the heart to the left with some elevation of the left border from the diaphragm. Since normally the right border of the heart is hidden by the vertebral column, this left shift of the heart is easily interpreted as a true enlargement of the heart, such as is observed in a congenital, or mitral heart. For the same reason the right hilar and trunk shadows which usually are overlapped by the right cardiac border will appear quite prominent giving the im-

pression of pneumonia or congestion. In the lateral view the sternum protrudes backward, lying well behind the chest wall.

Minor electrographic abnormalities are also described in the literature. These occur chiefly in chest leads and are interpreted as being due to a combination of the left shift and axial rotation of the heart rather than to associated myocardial damage. In the authors' series right axis deviation was noted only twice and notching in leads 2 and 3 was seen once. Lead CF was taken in each patient and slight T wave changes in this lead were found to be the most constant variation. In one case there was a bigeminal rhythm due to regularly recurring right ventricular extrasystoles. The authors considered this to be due to irritation of the right ventricle by the constant pressure of the deformed sternum.

The roentgenograms made in the posteroanterior and lateral views, are reproduced in all 9 cases, and accompanied with a brief synopsis of the case reports. The knowledge of this condition is important when interpreting phot fluorograms.

T LUCIFRA, M.D.

Gould C. L., and Dalley M E: Simultaneous Radiographic and Gastroscopic Examination of the Stomach. *Rad diag* 1947 45 8

Simultaneous fluoroscopic and gastroscopic examination of the stomach was made in 4 patients. After various contrast media had been tried in an attempt to find a transparent yet radiopaque substance, the authors finally selected for their studies a mixture composed of equal parts of saturated aqueous solution of methyl cellulose and diiodrast. Immediately after emptying the stomach, 60 c.c. of the mixture were instilled and the gastroscope was promptly inserted while the patient was lying on his left side on the radiographic table the head being supported by an assistant. A preliminary test for the three blind areas encountered at gastroscopy was made on the stomach of a fresh cadaver.

Roentgenograms showed that over inflation with air caused the lower pole of the stomach to move ventrally and to rise (with the patient in the conventional lateral left decubitus position) and interfered with visualization of the pylorus. On the other hand it was found that the blind area in the gastric fundus could be reduced by this method.

The principal causes of blind areas are: adherence of the gastric wall to the front lens of the gastroscope (required focal distance 0.5 cm.), absence of retrograde vision necessary for viewing the dome of the gastric fundus, and separation of the light source from the objective of the instrument causing poor collimation of the field of vision and the field of illumination.

The new omnangle gastroscope, by allowing the angulation of the objective to be shifted at will

during so examination has somewhat reduced the extent of the areas hidden behind the angulus and near the cardia.

A correlation of the roentgenological and the gastroscopic mucosal pattern of the stomach was impossible because of inadequacy of contrast material which tended to pool in the dependent portion of the stomach.

The authors conclude that studies of this nature may lead to an earlier recognition of gastric fixation, especially if it is caused by perigastric disease.

CERHART S. SCHWARTZ, M.D.

Jansson G. Roentgen Diagnosis of Adrenal Tumors. *Acta rad. Stockholm* 1946 27 536

The author reports a case of teratoma of the adrenal in a woman of 51 who was losing weight and had noted a mass in the left side of the abdomen. On examination, a ballotable mass about the size of a fist was palpable just below the ribs on the left. The patient showed no signs of virilism; the blood pressure was normal and urological examination revealed no abnormality.

Roentgen examination showed a mass situated on the medial and posterior aspects of the left kidney, extending from just below the level of the superior renal tip down to within 3 cm. of the iliac crest and producing a concave impression on the psoas muscle. The striking thing about this mass was the dense homogeneous calcification of its upper pole. A pyelogram revealed no intrinsic abnormality of the renal pelvis and calyces, which in spite of the obscuring calcification could be satisfactorily identified by the combined use of upine and lateral views. There was a slight dislocation of the kidney and proximal ureter medially and inferiorly together with rotation of the organ. The upper pole of the tumor lay at about the level of the superior calyces—lower than the normal position for the adrenal gland. It was believed that the mass was either an adrenal tumor or less likely a renal tumor arising in the lower pole of the renal cortex and not affecting the pyelogram.

At operation a neoplasm about the size of two fists was found and easily peeled off the uninvolved kidney. On section it proved to be a partially calcified adrenal teratoma with sarcomatous change of the lower pole, which finding was believed to account for its recent rapid increase in size. It was thought that the rather low position of the upper pole of the tumor as compared with the usual site of the adrenal gland could be explained by the considerable weight of the neoplasm dragging it downward along the dorsal surface of the kidney.

The author who has reviewed a considerable material has never encountered so dense and homogeneous calcification in a renal tumor but considers the finding significant in differential diagnosis as favoring a renal origin. In contrast to such calcification with the quite different granulated plotchylenities often associated with tuberculosis of the region. He refers to 3 other cases of partially calcified

adrenal tumor culled from the literature: one of them a pyramoma showing calcified plaques; he does not discuss the frequency with which calcification or ossification is found in teratomas in general.

LILLIAN DONALDSON, M.D.

Gillespie H. W. Further Observations on the Roentgenological Diagnosis of Lumbar Intervertebral Disc Lesions. *Brit. J. Radiol.* 1947 20 37

The two principal findings in straight roentgenological examination of lumbar disc lesions are decreased intervertebral space and hypertrophic fringe formation. The author believes that up to 45 per cent of all cases of prolapsed disc will show narrowing of the interspace.

One hundred cases showing this roentgen sign are presented. All of the patients complained of backache with or without an accompanying sciatica. Cases showing a decreased interspace attributable to tuberculous or staphylococcal infection or generalized osteoarthritis spondylolysis or spondylolisthesis were not included in this series. Eleven per cent of the patients showed hypertrophic fringe formation at the site of narrowing; 73 per cent of all cases were proved at operation; 10 per cent of the patients (showing only slight narrowing and no fringe formation) had no protrusion. In 26 per cent no operation was performed.

This series of cases was analyzed with regard to the interval between the onset of pain and the demonstration of narrowing of the interspace.

The longest interval was 27 years; the shortest 1 month. In 16 cases there was a time interval of only 1 to 5 months. Seventy per cent of the patients were able to give not only the time of onset of pain but also a definite cause; 25 per cent gave no history of injury but remembered a sudden onset of pain; and only 5 per cent were unable to give either the approximate date of onset of pain or a definite cause of the condition.

R. B. LEWIS, M.D.

Gemignani V.: The Stratigraphic Roentgenological Picture of the Arch of the Large Azygos Vein. (*Il quadro radiologico stratigrafico dell'arco della vena grande azygos*) *Radiol. med.*, Milano 1946 32 342

In 15 per cent of the usual roentgenograms of the thorax the large azygos vein can be seen as a shadow surrounded by air and aerated tissue, i.e., medially by the right bronchus and laterally by the pulmonary parenchyma. Because of its round shape and location the shadow was described by Crane in 1918 as that of a lymph gland, but Bu 1 and Ottonello interpreted it as the arch of the azygos vein where it rides the right bronchus. Absence of this shadow is due to anatomical anomalies of the vein itself. The study of the azygos vein requires three projections: the sagittal, the right anterior oblique at an angle of 45 degrees or more, and the left anterior oblique with only a few degrees of rotation. Because of its communication with the superior vena cava, the right

heart the inferior vena cava, and the portal system by way of the esophageal veins, the azygos vein assumes the role of manometer of the venous endo-thoracic pressure having been found larger than normal in cardiacs in the stage of decompensation in portal stasis, in Basedow's disease and in therapeutic pneumothorax of the left side and smaller than normal in left pleural effusion and in therapeutic pneumothorax of the right side. The method of study consisted in removing from the cadaver most of the vertebral column. This exposed the azygos vein in its straight course to the fifth thoracic vertebra where it curved laterally to ride the right bronchus and enter the superior vena cava. The vein was ligated at the straight end and an aqueous solution of barium sulfate was injected at the beginning of the curve.

In the stratigraphic study after a routine anteroposterior roentgenogram of the chest, a roentgenogram is taken at a stratum at one-half the depth of the anteroposterior diameter and a second one at one half the depth plus 1 cm. If the vein still is not visible a third roentgenogram is taken at a stratum at one-half the diameter plus 2 cm. The other data were as follows: angle of rotation, 15; exposure 0.2 second and focal distance, 150. With this technique, the author was able to demonstrate the shadow of the arch of the azygos vein in 4 patients with chronic myocarditis and beginning decompensation in 1 with moderate pleural effusion in 2 with hepatic cirrhosis and ascites and in 2 with tubercular peritonitis with effusion. JOURNAL OF A. PAPA, M.D.

Mustakallio, S. The Relation of the Microscopic Structure of Laryngeal Cancer to Radiocurability. *Acta radiol. Stockh.* 946: 1-473.

Of 201 cases of laryngeal cancer in which treatment by irradiation was carried out at the Central Institute for Radiotherapy at Helsinki, the author found 67 cases suitable for a study dealing with the relation of microscopic structure to radiocurability. His criteria for the selection of this group were as follows:

The tumor had been studied microscopically in each case; the treatment (referred to in a previous paper in 1944) had not been interrupted in any way; all patients had lived and had been followed for at least 5 years, or had died before then of recurrence. All cases in which the patient had died from some other illness within the 5 year period, but had been free of symptoms of recurrence, were excluded, as recurrence might have occurred before the lapse of the full period of 5 years.

The classification of Broders was followed in grading these squamous cell epitheliomas: grade I with a differentiation of 75 to 100 per cent of cells; grade II with a differentiation of 50 to 75 per cent; grade III 25 to 50 per cent, and grade IV from practically none to 25 per cent differentiation, grade I and grade IV being the easiest to classify. Every effort was expended to make the grading objective. The author stresses not only the difficulty of grading a

Grade	Cases	No. of cases of cancer after 5 or more years	Dead or not cured
I		6	6
II	26	10	26
III			20
IV	2	1	2
Totals	67	(17%)	4

given histologic section accurately but also the possibility that the biopsy may not represent the grade of differentiation in some other part of the tumor.

The result of this classification in comparing cell differentiation with the clinical result of irradiation treatment, is presented in the accompanying table. This table shows that the best results were obtained in grade I and grade IV neoplasms—the most and the least differentiated—considered. In general, the least and the most radiosensitive, while the poorest results were obtained in grade III neoplasms. In this connection the author recalls the material of Phillips comprising 71 irradiated neoplasms of the oral cavity in which no correlation could be established between grade of primary growth and its reaction to irradiation. Although, according to Broders, the grade of malignancy of carcinomas is as a rule in direct proportion to their proliferative metastasizing and death-dealing capacities.

In an effort to discover reasons for these results, the author further classifies his material into clinical stages at the time treatment was undertaken, stage I being that in which the carcinoma only superficially infiltrated one or both cords so that the cords still moved freely; stage II being that in which infiltration had extended so deeply into surrounding tissue that the cords were immobile or nearly so or in which extension to cartilage had occurred, and stage III that in which the neoplasm had extended beyond the larynx or had involved lymph nodes.

When the preceding clinical stage was then compared with the microscopic grade, it was found that grade I cases had been treated at a considerable earlier stage of development than the cases of other groups, probably because grade I carcinomas develop relatively slowly and the author concludes that the relatively early stage at which treatment was begun in these cases made up for their relative radio-insensitivity. As regards the relatively advanced clinical stage at which most of the patients in grade IV presented themselves for treatment, he believes their great radiosensitivity to be the compensatory factor which allowed relatively good results to be obtained. For the failure of treatment in grade III cases, he can only suggest that they have the dangerous qualities of both the differentiated and undifferentiated carcinomas—a 25 to 50 per cent of differentiated cells which are radioresistant, combined with considerable tendency to grow rapidly and to metastasize. LILIAN DONALDSON, M.D.

Lehmann P: Treatment of Multiple Bone Metastases with Widespread Osteolysis of the Vertebrae or Ribs by Radiotherapy in Massive Doses Combined with Total Teleradiotherapy. Disappearance of the Radiological and Clinical Signs (Traitement des métastases osseuses multiples avec ostéolyses étendues vertébrales ou costales par la radiothérapie à doses massives associée à la téléradiothérapie totale. Disparition des signes radiologiques et cliniques) *Mém Acad chir. Par.*, 1946 72 571

In no form of cancer are early bone metastases so frequent as in breast carcinoma. Until recently these metastases seemed to be beyond all therapy, and the physician was helpless against the rapid development of cachexia complicated by paraplegias and pathological fractures. Radiation therapy was tried early in these conditions but only lately has apparatus of sufficient potency and effective technique been devised which permit successful check of the metastases. Although it is not yet possible to cure the patient permanently by this treatment life can be prolonged and activity maintained for years. In addition to this, the excruciating pains caused by pressure of bone metastases on nerves are relieved after a short period of treatment.

The author presents 4 cases which were treated by roentgen therapy of the metastases in combination with general teleradiotherapy. The applied doses were about 3 times as high as the usual ones. In order to avoid roentgen damage of the skin and tissues, the author used a method of desensitization which is not described in this article. It is of particular interest that no anemia developed during the treatment on the contrary the erythrocyte count and the hemoglobin increased during the irradiation and only transient leucopenia was observed. On the basis of 50 cases of irradiation of cancer the author believes that the anemia of the carcinomatous patient is due to the progress of the cancer rather than to the irradiation.

The success of the treatment is decidedly impressive. One patient whose history is given in detail complained, 33 months after removal of a carcinomatous breast, of excruciating pains in the left arm, paresthesias in the area of the mandibular nerve, and severe pains in the left lumbar region. The roentgenogram revealed that the entire left first rib as well as the anterior arc of the second were inviable, and another large metastasis was present at the fourth lumbar vertebra, with extensive decalcification so that the superior border of the bone was effaced. Within 3½ months the patient received 51 treatments of total teleradiotherapy and at the same time 23 500 roentgens on the metastases from different fields. Soon after the completion of this treatment the pain in the lumbar region cleared up completely and during the next few months the general condition improved and the pains caused by involvement of the brachial plexus decreased steadily so that about 6 months after the last irradiation the patient was free from all symptoms and had resumed her normal activities. At this time, the

roentgenogram showed recalcification of the first and second ribs and a perfectly normal picture of the fourth lumbar vertebra. Four months later the patient returned complaining of pains in the back. X-rays revealed new metastases in the twelfth dorsal and the first lumbar vertebrae. These were treated by combined teleradiotherapy and focal irradiation with perfect clinical and roentgenological success. Shortly after new lesions appeared at the sacroiliac junction and the right femur which were subjected to the same treatment. At the time of the publication, the patient appeared to be in perfect health. Altogether she had received 55 000 roentgens locally and 78 treatments of total teleradiotherapy. No untoward side effects of the treatment were observed.

WERNER M. SOLMITS, M D

Stampfl W P and Kerr H D: Fractures of the Femoral Neck following Pelvic Irradiation. *Am J Roentg* 1947 57 71

Postirradiation fractures of the femoral neck were first reported in 1927. Since then many additional cases have been reported in the literature. Theories such as necrosis secondary to vascular damage, the use of pelvic fields in irradiation, and bone which fractures easily following irradiation are offered as a cause of these fractures. The most plausible theory advanced is that of vascular damage and bone absorption. Failla showed that bone absorbs 40 per cent more irradiation than does soft tissue. Osteoblasts are supposedly more sensitive than osteoclasts. Boyd stated that the two chief factors in bone absorption are vascular absorption and osteoclastic activity.

Three cases of the present series were studied by means of biopsy. Osteoporosis was the outstanding feature.

Of 1,372 patients irradiated for pelvic carcinoma 12 developed fracture of the femoral neck. This represents an incidence of 0.87 per cent. Lateral fields were used in all instances. The average age was 56 years. Four patients showed additional roentgen changes in the pelvis.

The interval between therapy and the appearance of the first symptoms was 2 years and positive roentgen findings were noted at 29 months. The symptoms were dull pain, becoming progressively worse and aching, especially when the patients were erect.

Roentgenograms made at the time of therapy revealed that the femoral neck was not always covered in the anterior and posterior fields. The roentgen appearance was one of subcapitate mottling (An early fracture line is never absolutely clear.)

Treatment depends on the condition of the patient. In most instances immobilization suffices; in 2 cases with displacement, reduction and immobilization were satisfactory.

The authors are of the opinion that the risk of skeletal damage has been exaggerated. When a fracture occurs, the prognosis is good.

MAURICE D. SACHS, M D

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Treatment depends on the condition of the patient. In most instances immobilization suffices. In 2 cases with displacement reduction and immobilization were satisfactory.

The authors are of the opinion that the risk of skeletal damage has been exaggerated. When a fracture occurs, the prognosis is good.

MAURICE D. SACHS, M.D.

extremity in addition there was hypertrophy of the involved arm, especially of the right hand. The distance from the acromion to the styloid process of the radius was 90 cm. on the right side and 86 on the left. Also the diameters of the right arm, forearm, wrist, and metacarpal region were larger on the right side than on the left. Roentgenograms showed that not only the soft tissues but also the osseous structures were hypertrophic. The cervical spine was intact.

If a flat nevus coexists with hypertrophy of the involved extremity, the condition is called "Parkes-Weber syndrome" while the name Klippel-Trenaunay syndrome is used when the angioma is associated with congenital varicosities and malformations of the face or one or more extremities.

As to the pathogenesis of the condition, variations of the genotypes subject to the mendelian law do not come into consideration. A local congenital malformation is the basis of the condition. Such a malformation may be explained by two theories: the first incriminates anomalies of the arteriovenous net work, while the second considers the syndrome as the result of a congenital sympathetic lesion.

According to the first theory, vascular dystrophy is the primary lesion. Venous hypertension and an excessive blood supply produce hypertrophy of the affected limb. Abnormal arterial distribution and sometimes an arteriovenous short circuit have been demonstrated by arteriography. Surgical intervention, by diminishing the vascular malformation, permits marked decrease in the size of the angioma and of the affected extremity.

However the second theory explains the genesis of the condition in a better way. A functional paralysis of the sympathetic system was very evident in the authors' patient, in whom an acceleration of the blood flow and a diminution of the venous pressure in the involved extremity could be demonstrated. Apparently the sympathetic system lost its vasoconstricting control in the involved area. Infiltration of the stellate ganglion failed to produce any changes on the affected side. Electric nerve baths also failed to cause any noticeable changes. If primary vascular malformations were present, the existence of multiple lesions would have to be assumed. The absence of varicosities in the authors' patient militates against the presence of any obstacle to the return flow of blood.

sympathetic functions. Therefore the authors conclude that the lesion was probably located in Clarke's column. The trophic effect of the sympathetic system, exercised through the vasomotor nerves, probably was disturbed.

JOSEPH K. VARAT, M.D.

DUCTLESS GLANDS

Salomon P., and Seluzkewski, A.: Thyroid Disturbances of Opposite Types in Female Twins (Réactions thyroïdiennes de sens inverse chez deux jumeaux). *Ann. endocr. Par.* 1946 7 317

This is a case report of dizygotic female twins, one of whom presented a clear case of cretinism whereas the other offered definite signs of hyperthyroidism. It is well known that there are families in which thyroid disturbances seem to be hereditary part of the siblings presenting myxedematous, and the others presenting hyperthyroid, traits. In this case, the mother showed a case of slight hypothyroidism and had come from Alsace where goiter is endemic.

WERNER M. SOHNKE, M.D.

SURGICAL PATHOLOGY AND DIAGNOSIS

Hogder J.: Carcinogenic Substances in Human Tissues. *Cancer Res.* 1946, 6 657

Some of the problems presented by the carcinogenic substances that have been extracted from human tissues will be solved only when these compounds have been chemically identified and assayed. At the present time very difficult questions have been raised by the fact that the substances have been found in the tissues from some patients dead because of cancer but not in others, and further in the tissues of some subjects dead because of diseases other than cancer and again not in others.

Attention is drawn to the main difficulties in this investigation: (a) the low potency of human tissue carcinogens as indicated by the prolonged latent period; (b) the sporadic occurrence of these substances; and (c) the uncertainties with regard to "susceptibility" of the experimental mice.

A technique of fractionation of unassailable material from tissues is described.

A sarcoma producing fraction has been obtained from mixed lung and kidney muscle of cancerous and noncancerous human subjects and from the liver of cancerous patients.

MISCELLANEOUS

CLINICAL ENTITIES—GENERAL PHYSIOLOGICAL CONDITIONS

Koroff, D. D., Hoffman, W. S., Meyer, K. A. and Garvin, T.: High Protein Therapy; Clinical Effectiveness of Oral Administration of a New Protein Preparation as Determined by Nitrogen Balance Studies. *Arch. Surg.*, 1946, 53: 683

Maintenance of the nitrogen balance by the oral intake of various protein digests has been disappointing to date, presumably because the amount of protein digests required and their bad taste eventually proved nauseating.

This article deals with the results of maintaining a positive nitrogen balance in 14 surgical patients with a new processed protein, essenamine, which has no odor and no pronounced taste. It can be incorporated in palatable food in large quantities without disturbance of the patient's digestive system. Essenamine is a yellow white nonhygroscopic powder obtained by the partial alkaline reduction of lactalbumin. It contains 12.5 per cent nitrogen and is high in essential amino acid content.

The minimum requirements for nitrogen balance were determined by placing 11 of the 14 patients on a set diet after which all were put on the high protein intake.

In 12 experiments in which essenamine was used as the main ingredient of a high protein diet for periods ranging from 7 to 20 days, 0.52 gm. of nitrogen per kilogram per day was given orally. This diet produced positive nitrogen balances ranging from 6 to 20 gm. of nitrogen per day with an average of 12 gm. With the high essenamine intake, 52 per cent of the ingested nitrogen was excreted in the urine, 5 per cent was excreted in the feces, and 42.8 per cent was retained; this indicated the high digestibility and the high biologic value of the proteins ingested.

Both the maintenance and the high protein diet produced increases in the body weight, plasma volume, the serum protein and serum albumin concentrations and in the total circulating albumin. The diets for the minimum and high essenamine intake are appended in the original article.

STEPHEN A. ZIEGLER, M.D.

Fontaine, R. and Forester, E.: Old Ulcerated Radiodermatitis Cured by the Combined Use of Low Lumbar Sympathectomy, Saline Drip and Skin Grafts. Three-Year Follow up (Radium dermite ulcéreuse ancienne guérie par la méthode associée sympathéctomie lombaire basse, goutte-salée au sérum physiologique et greffes cutanées. Résultat de 3 ans). *Rev. chir., Par.*, 1946, 65: 277

In 1923 Cundermann reported 3 cases of ulcerative radiodermatitis cured by periarterial sympathectomy. In 1935 Lenche and Fontaine, who had used periarterial sympathectomy followed by skin graft

ing for chronic ulcers of the leg, tried this method in 2 cases of ulcer following roentgen therapy. In 1939 Lenche and Fontaine presented a review of 27 cases of ulcerative radiodermatitis, treated with sympathectomy up to that date, with 12 cures, 7 ameliorations and 8 failures. Nevertheless only a few cases have been subjected to this treatment since that date, whereas numerous other methods have been used, including the use of insulin ointment, Lactanhe serum, infrared rays, and surgical excision followed by ultraviolet irradiation or preceded by the administration of silver nitrate. Also ointments containing vitamins A and D have given good results.

However, some cases of old radiodermatitis with necrosis resist these measures, and it is for these that the author would recommend the combination of sympathectomy and skin grafting. Sympathectomy may be accomplished by local infiltration or atellar or lumbar infiltration. The sympathectomy will not suffice. It merely creates a zone of hyperemia at the level of the ulcerations. The latter must then be treated with a drip of 3/4 or 3/8 of a liter of physiological saline solution from a height of from 20 to 30 cm. into every crevice of the ulcer. This permits rapid disinfection and mechanical cleansing of the lesion which together with the hyperemia produced by the sympathectomy leads to rapid transformation of the previously torpid ulcer into a bright red granulating wound. In this condition it is in a favorable state for the reception of skin grafts, preferably of the Davis type. The resulting scar is stronger than that produced by spontaneous epidermization, which improves the late results. A case of most severe ulcerative radiodermatitis of many years' duration responded to this treatment. The patient was seen 3 years after the treatment and there had been no recurrence.

The authors stress the importance of making a biopsy examination of the ulcer area before sympathectomy is done because if malignant degeneration is present this treatment would be futile.

EDITH SCHWARTZ MOORE

Poinso, R., Charpin, J. and Deprest, A.: Case of Thoraco-brachial Nerve with Osteohypertrophy of the Entire Upper Extremity (Parkes Weber Syndrome) [A propos d'un cas de neurov thoraco-brachial avec ostéo-hypertrophie du membre supérieur droit. Syndrome de Parkes (Weber)]. *Presse Méd.*, 1946, No. 63: 865

In 1910 Klippel and Trenaunay described a condition called osteohypertrophic nerve. Practically the same disease was described by Parkes and Weber in 1918.

A 57 year old man observed by the authors had flat, extensive angiomas of purplish color which covered the right side of the chest and the right upper

extremity in addition there was hypertrophy of the involved arm, especially of the right hand. The distance from the acromion to the styloid process of the radius was 90 cm. on the right side and 86 on the left. Also the diameters of the right arm, forearm, wrist, and metacarpal region were larger on the right side than on the left. Roentgenograms showed that not only the soft tissues but also the osseous structures were hypertrophic. The cervical spine was intact.

If a flat nevus coexists with hypertrophy of the involved extremity, the condition is called Parkes-Weber syndrome,¹ while the name "Klippel-Trenaunay syndrome" is used when the angioma is associated with congenital varicosities and malformations of the face or one or more extremities.

As to the pathogenesis of the condition, variations of the genotypes subject to the mendelian law do not come into consideration. A local congenital malformation is the basis of the condition. Such a malformation may be explained by two theories: the first incriminates anomalies of the arteriovenous network, while the second considers the syndrome as the result of a congenital sympathetic lesion.

According to the first theory, vascular dystrophy is the primary lesion. Venous hypertension and an excessive blood supply produce hypertrophy of the affected limb. Abnormal arterial distribution and sometimes an arteriovenous short circuit have been demonstrated by arteriography. Surgical intervention, by diminishing the vascular malformation, permits marked decrease in the size of the angioma and of the affected extremity.

However, the second theory explains the genesis of the condition in a better way. A functional paralysis of the sympathetic system was very evident in the authors' patient in whom an acceleration of the blood flow and a diminution of the venous pressure in the involved extremity could be demonstrated. Apparently the sympathetic system lost its vasoconstricting control in the involved area. Infiltration of the stellar ganglion failed to produce any changes on the affected side. Hot and cold baths also failed to cause any noticeable changes. If primary vascular malformations were present, the existence of multiple lesions would have to be assumed. The absence of varicosities in the authors' patient militates against the presence of any obstacle to the retro flow of blood.

□ Undoubtedly the sympathetic alteration was situated in the central portion of the sympathetic system, namely the lateral horn of the spinal cord, or in the stellar ganglion. Limitation of the angiomatous to one half of the body and their metameric arrangement does not suggest a peripheral lesion of the autonomic nervous system.

The lower limit of the dorsal patches corresponded to the lower border of the cutaneous territory of the stellar ganglion. Suppression of the vasomotor function, with the presence of pilomotor reflexes and perspiration points to a central alteration because a lesion of an axial ganglion would disturb all of the

sympathetic functions. Therefore the authors conclude that the lesion was probably located in Clarke's column. The trophic effect of the sympathetic system, exercised through the vasomotor nerves, probably was disturbed.

JOSEPH K. NAYL, M.D.

DUCTLESS GLANDS

Sainton P., and Scliszewski A.: Thyroid Disturbances of Opposite Types in Female Twins (Réactions thyroïdiennes de sens in vers chez deux jumelles) *Ann cadec Par* 946, 7-17

This is a case report of dizygotic female twins, one of whom presented a clear case of cretinism whereas the other offered definite signs of hyperthyroidism. It is well known that there are families in which thyroid disturbances seem to be hereditary: part of the siblings presenting myxedematous and the other presenting hyperthyroid traits. In this case, the mother showed signs of slight hypothyroidism and had come from Alsace where goiter is endemic.

WALTER M. SOLMITZ, M.D.

SURGICAL PATHOLOGY AND DIAGNOSIS

Hilger I: Carcinogenic Substances in Human Tissues. *Cancer Res* 946, 6 637

Some of the problems presented by the carcinogenic substances that have been extracted from human tissues will be solved only when these compounds have been chemically identified and assayed. At the present time very difficult questions have been raised by the fact that the substances have been found in the tissues from some patients dead because of cancer but not in others, and further in the tissues of some subjects dead because of diseases other than cancer and again not in others.

Attention is drawn to the main difficulties in this investigation: (a) the low potency of human tissue carcinogens as indicated by the prolonged latent period; (b) the sporadic occurrence of these substances; and (c) the uncertainties with regard to susceptibility of the experimental mice.

A technique of fractionation of unassailable material from tissues is described.

A sarcoma-producing fraction has been obtained from mixed lung and kidney muscle of cancerous and noncancerous human subjects, and from the liver of cancerous patients.

In all 3 cases the carcinogenic substance was found in the cholesterol-rich fraction of the unassailable material. This fraction is a crystalline mixture of compounds containing about 85 per cent cholesterol on the average.

JOSEPH GASTEL, M.D.

EXPERIMENTAL SURGERY

Copp J.L.: The Role of Nuclear Physics in Medicine and Dentistry: Applications in Medicine. *J. Orthodont.*, 947 33 10

In considering the practical value of a project in research, three factors must be considered:

1. Its availability and ease of production.
 2. The half life or time for half the radioactivity to decay must be sufficiently long to permit experimentation. Ten half lives are usually considered the longest period for which an experiment can be run and in the case of the short lived isotope of carbon C^{14} this has been a serious limitation. This isotope with a half life of only 21 minutes, has been used for very important experiments but these were of necessity for very short periods.

3. The radiations should be sufficiently energetic so that they may be easily measured without recourse to complicated equipment.

Radioactive iodine may be obtained from the cyclotron or the atomic pile. It has an energetic radiation and a convenient half life of 8 days. The thyroid contains most of the iodine in the body and has tremendous powers of selective concentration. Significant amounts of radiiodine appear in the gland a few minutes after injection into rabbits. These results were confirmed in human patients. Cases of hyperthyroidism show a characteristic increase in iodine uptake and turnover, thus providing a diagnostic means for distinguishing between true hyperfunction of the thyroid gland and somewhat similar symptoms which are not due to thyroid disease. Radioactive iodine should prove of equal value in the often difficult diagnosis of myxedema and cretinism, since in these cases, there is little or no concentration of such iodine in the thyroid. There have already been studied conditions in children, diagnosed as hypothyroidic, in whom tracer studies revealed normal iodine uptake and presumably normal function of the thyroid; these patients cannot be expected to respond to thyroid treatment and other causes for their retarded development must be sought.

Since there is an uneven distribution of radioactive iodine in the thyroid gland with the heaviest concentration in the regions of overactivity hyperthyroidism may be treated by administering a dose of radioactive iodine sufficient to destroy by irradiation the overactive cells in which the concentration is high without damaging other tissue or killing the normal thyroid cells. Since, however, most thyroid cancers do not take up a significant amount of radioactive iodine this method is not applicable in the treatment of thyroid cancer.

Two radioactive isotopes of iron are suitable for biologic work. By injecting radioactive iron into dogs, it was found that the elimination of iron from the body is almost negligible. Thus the controlling factor in regulating the body stores must be absorption from the gut. Feeding experiments with radio iron have shown that absorption occurs only when there is a need as in the anemia due to iron deficiency or following hemorrhage. Patients with pernicious anemia on the contrary absorbed very little radio iron and so are not helped by its administration.

Radioactive carbon because of its short half life, can be used only for short term experiments. Despite this handicap however it has been found that when

an animal breathes an atmosphere containing C^{14} labeled carbon dioxide some of this radio carbon is actually fixed in the liver glycogen and blood sugar.

Radioactive phosphorus is easily prepared. Its radiations are easily measured and it has a convenient half life of 14.3 days. It has been used to investigate many problems in lipid and carbohydrate metabolism and for the study of bone and teeth. It has been found that the nuclei of fast growing tumors take up far more radiophosphorus than does normal tissue. Its use for the specific irradiation of these highly malignant cells was therefore suggested.

The patients selected for treatment were suffering from types of disease known to be radiosensitive—leukemia, lymphoma, myeloma, and polycythemia vera. The dose must be carefully controlled to prevent excessive destruction of the bone marrow and yet obtain effective radiation. The results on leukemic patients were, at least as good as those from intensive x ray therapy and rarely caused any radiation sickness. In most cases the white count returned to normal and the patient felt much better. The remissions were, unfortunately, only of a temporary nature.

The use of radioactive materials in medicine is still in its infancy. Progress will have to be cautious and under the control of radiologists who are aware of the great radiation hazards and are trained in the special problems of radiobiology.

SAMUEL KAHN M D

Copp H. The Role of Nuclear Physics in Medicine and Dentistry. Use of Radioactive Tracers in the Study of Bones and Teeth. *Am J Orthodontol.* 1947 33 109

Radioactive tracers should find considerable application in dental research because they provide one of the few practical methods for studying the limited metabolic activities of bones and teeth. The ease with which minute amounts of these radioactive materials may be accurately measured and distinguished from the mass of inert element in the teeth is particularly valuable. Radioactive tracers should prove useful in studying many problems of calcification and mineral exchange. They can also be used in investigating fluorosis, caries, protection, periodontal disease, root resorption, nutritional and endocrine effects, and many other dental problems.

Since, however, the effects of chronic radiation poisoning are insidious and very dangerous clinical experiments should be limited to isotopes of short half life and the dose of radioactivity should be kept as low as possible.

SAMUEL KAHN M D

Lorenz B.: Studies on Experimental Osteogenesis by Homotransplantation of Living Mucosa (Tentati di osteogenesi sperimentale con omotransplanti di mucosa viventi). *Sperimentale* 1946 95 162.

Huggins' observation that transplanted mucosa of the urinary bladder possesses osteogenic property brought up two questions.

INTERNATIONAL ABSTRACTS OF SURGERY

1. Is this property of the mucosa of the urinary bladder specific or does the mucosa of other organs display a similar effect?
2. Is homotransplantation from one individual to another as effective as autotransplantation?

The author performed a series of experiments on rabbits and dogs. A segment of the vesical mucosa 1 cm. in diameter was removed from the bladder and implanted into the aponeurosis of the rectus muscle of the abdominal wall. Specimens for histologic examination were removed at various intervals starting with the twentieth day after transplantation. The last specimen was removed between the sixtieth and seventieth days after the experiment. In no case of homotransplantation did the author succeed in producing osteogenic processes in the transplanted mucosa or adjoining tissues.

In addition to the experiments with transplantation of vesical mucosa in rabbits the author used also segments of the gastric mucosa and of the gall bladder mucosa. The results in all cases were negative.

Lorenz B: Osteogenesis of Autotransplants of Living Mucosa (Osteogenesis da autotransplanti di mucosa vivente). *Sperimentale* 1945 98 70

Heterotopic production of osseous tissue by transplanted epithelium of the urinary tract has been reported by Haggins.

The author studied the problem in dogs using trypan blue vital staining. Squar segments of gastric mucosa or mucosa of the gall bladder 1 cm. in diameter were implanted into the aponeurosis of the abdominal rectus muscle of the donor. The operations were performed under morphine-ether anesthesia and the removed portion of the mucosa were kept in a lukewarm sterile saline solution until ready for implantation. All wounds healed first in 7 days after implantation.

No osseous material could be detected at autotransplantation of the mucosa of the gall bladder or the stomach wall. On the other hand ossification was produced in all 5 dogs in which a segment of vesical mucosa was used for transplantation. The ossification processes were always most intensive at the margins of the transplanted tissues.

The author concludes from his experiments that in all probability the osteoblasts are of fibroblastic origin. They did not take the vital stain.

JOSEPH K. NARAY, M.D.

Baxter IL, and Moore R. H.: The Effect of the Local Reduction of Temperature on Scald Burns in the Rat. *Ann S S* 1947 15 177

A study has been made of the effects of local hypothermia on the healing of thermal burns in white rats. A moderate consistently uniform burn was produced in etherized white rats by immersion of the tail in water at 100 degrees C. Only the terminal 15 centimeters of each tail were burned. The animals were then kept in separate wire cages which permitted the tails to rest on a gauze tray. The tails of the burned rats projected into a cooling chamber through which cold air circulated, the temperature varying from 36 degrees F. to room temperature. The control rats were kept in similar cages but their tails were exposed to room temperatures varying from 75 to 80 degrees F. The tails of all surviving rats were examined grossly and histologically.

The studies indicate that hypothermia is definitely harmful to burned rats under the conditions described. An apparently immediate beneficial effect of cooling after a burn characterized by diminished swelling and necrosis gave way to extensive swelling and necrosis when the temperature was raised to room temperature. The harmful effects of cooling seem to be associated with the relaxation and distention of the blood vessels and the plugging of the lumen of many of the vessels with red blood cells. The results indicate that a permanent vasospasm occurs while the tissues are being cooled at temperatures as high as 63 degrees F. for a period of 8 hours and it is clear that a breakdown of the circulatory system can occur in tissues which are cooled but not frozen. It is noted that the lowest temperature used, 30 degrees F. resulted in the most severe damage while a temperature of 63 degrees F. for a relatively short period after burning produced only slightly more damage in the burned tails than occurred in the burned control rats in room temperature of 75 degrees F. The findings suggest that the optimum temperature for burns may be between 65 and 75 degrees F.

FRANK F. KATZMAN, M.D.

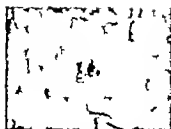


Fig. 1

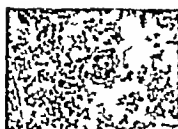


Fig. 2

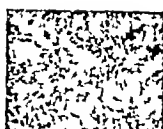


Fig. 3

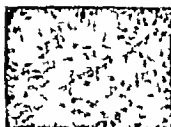


Fig. 4

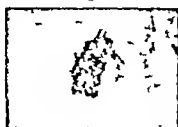


Fig. 5

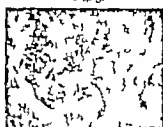


Fig. 6

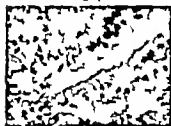


Fig. 7

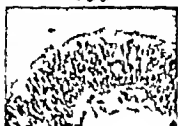


Fig. 8



Fig. 9

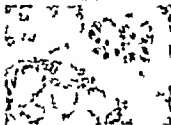


Fig. 10

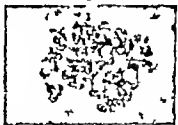


Fig. 11



Fig. 12

Cytologic Recognition of Cancer in Exfoliated Material from Various Sources —
 Warren C. Hunter and Howard L. Richardson

SURGERY

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CYTOLOGIC RECOGNITION OF CANCER IN EXFOLIATED MATERIAL FROM VARIOUS SOURCES

Useful Modifications of the Papanicolaou Technique

WARREN C HUNTER M D and HOWARD L RICHARDSON M D Portland Oregon

PAPANICOLAOU'S (6) investigations of desquamated vaginal epithelium began thirty years ago with a study of the morphologic and cyclic variations of cells in the vagina of the guinea pig and he first applied the technique to the diagnosis of uterine cancer in 1923 in the course of a study of human vaginal smears taken during the normal menstrual cycle. Despite this early recognition of the fact that cancers of the

uterus could thus be diagnosed, clinical men failed to see the potentialities of the method and Papanicolaou states that he lost his enthusiasm for it until he became associated with Traut (5) with whom he jointly published the monograph *Diagnosis of Uterine Cancer by the Vaginal Smear* in 1943.

The recent war years were not conducive to widespread dissemination and application of Papanicolaou's discovery, and only a few investigators have thus far had sufficient experience to enable them to publish the results of their studies. Among these are Meigs and associates, Ayre and again Papanicolaou (6).

From the Department of Pathology, University of Oregon Medical School, Portland, Oregon.

Aided by grant from the Oregon Division, American Cancer Society and by its Diagnostic Smear Laboratory, Ray S. Duham, technician.

Fig. 1. Vaginal smear. Only two cancer cells were found on the whole slide.

Fig. 2. Embedded material from same case as Figure 1. While only three cancer cells are present in the field others occurred elsewhere. Note that when concentrated by precipitation, many cells are seen and that all are in the same focal plane.

Fig. 3. Biopsy. Same case as Figures 1 and 2. Note how plainly the cancer cells in squamous cell carcinoma of the cervix are brought out in tissue stained by the Papanicolaou technique.

Fig. 4. Embedded and sectioned vaginal fluid illustrating how groups of cells often remain intact and how the pattern of tissue is preserved. These are mainly basal and precornified types of squamous epithelium.

Fig. 5. Smear of bronchial mucus. A clump of cancer cells is shown but parts of it are overlaid by cells, making the interpretation more difficult.

Fig. 6. Compare the cytology with Figure 5, which is the same case. In the embedded matter there is no doubling or folding and the cytology is excellent.

Fig. 7. Bronchial aspiration embedded. An intact segment of mucosa from a small bronchus has been obtained in an intact state.

Fig. 8. Embedded and sectioned bronchial aspiration. A portion of normal mucosa and submucosa has come off intact. Note the beautiful pseudostratification of the cells.

Fig. 9. Bronchogenic carcinoma found in bronchial mucus which was embedded and sectioned. Note the same continuity of pattern that one sees in tissue sections.

Fig. 10. Microscopic picture in mucus aspirated from the stomach. There are several normal gastric glands, separated by interglandular stroma, and one group of cancer cells. The differences between the two types is apparent.

Fig. 11. Finding in embedded mucus obtained on rectal examination. The growth was beyond the reach of the palpating finger. Histologically it proved to be an adenocarcinoma. These are cancer cells.

Fig. 12. Group of cancer cells from an instance of squamous cell carcinoma of the bladder. The cellular content of the urine was precipitated out with picric acid, filtered and embedded in paraffin.

Papanicolaou's (6) most recent communication deals not only with the smear technique as applied to uterine carcinoma, but describes its efficacy in bronchogenic, gastric, bladder and renal cancer. It now appears that the method is applicable to cancer involving or communicating with all body orifices.

As long ago as 1935 Dudgeon and Wrigley obtained a high percentage of accurate observations of bronchogenic carcinoma based on recognition of the cells in expectorated mucus, using Schaudinn's fluid as the fixative for the smears. Bamforth, 1946 employing the same technique as Dudgeon and Wrigley reports satisfactory results on freshly expectorated sputum of patients with pulmonary cancer.

To date few have attempted to modify the original Papanicolaou method of obtaining material or its preparation for study. In his last paper concerned with identification of cancer cells in other than vaginal secretion Papanicolaou (6) lists some modifications applicable to urine, gastric aspirations, and sputum. Ayre aspirates specimens directly from the cervix into a test tube rather than from the posterior fornix of the vagina, centrifuges, embeds in paraffin and stains all but the more questionable instances with ordinary hematoxylin-eosin.

Soon after we began to study vaginal fluid (November 1945) both the gynecologists and ourselves became dissatisfied with some features of the Papanicolaou technique and sought to eliminate what seemed to us to be certain inherent weaknesses. In the first place, we were unable to make good even smears by blowing the content of the glass tube on slides even though various means of smoothing out the thick areas were tried. There still remained too many dense spots and too frequent places where little or no matter was deposited. We could never convince ourselves that we were covering all fields in such smears microscopically. All too often groups of cells were overlaid by other epithelial cells or by leucocytes or there were thick patches through which we could not see well. Furthermore the time required to cover a slide an inch in width and occupied by a smear covering from 2 to 2½ inches of its length was appreciable if one really attempted to see all of it.

For the first modification most applicable to vaginal smears, we are indebted to Dr. Melvin Breese, senior resident in gynecology whose method is as follows:

1. A warm, but dry speculum, without lubricant should be used.

2. After insertion into the vagina, enough pressure should be made on the perineum to bring the speculum to as nearly a horizontal plane as possible.

3. The fluid in the posterior fornix is gently milked into the posterior blade of the instrument.

4. The speculum is carefully removed in order to retain all possible fluid.

5. A gloved index finger is dipped into the fluid and smears are made by means of two rapid, *longitudinally* directed swipes, leaving a space at one end for labelling. It is important to avoid the natural tendency to a circular motion of the finger in placing the fluid on the slide. Such smears are invariably thick and thin and are quite unsatisfactory.

5. The smear is placed directly into a jar containing alcohol-ether solution as described by Papanicolaou and Traut (5).

While this was a great improvement, we were still not satisfied, for it did not eliminate the faults inherent in any smear nor did it lessen the time required for microscopic study.

Confronted with a very thick smear made by a clinician who asked us to study his case and realizing that it would be a hopeless task, we noticed that a number of flakes had dropped off the slide into the alcohol-ether. These were recovered, embedded in paraffin cut as one does tissue and prepared with Papanicolaou's stain. The hopelessly thick portions still adhering to the slide were shaved off with a knife and handled in the same way. To our great gratification the cytologic structure was perfect and we were able to give the doctor a diagnosis of carcinoma. It was then that we first realized the possibilities of concentrating cells, lessening the space they would occupy on a slide and the saving of time that this would bring.

Turning to possible agents which would serve the dual purpose of precipitating protein and mucus and fixation of cells, we thought of saturated aqueous solution of picric acid, one

of the best precipitants of protein known and at the same time a good fixative. Furthermore, picric acid had the advantages of easy preparation, cheapness, and noninflammability.

However we soon learned that clinicians and nurses are not to be trusted to give the immediate care so necessary if cells are to be properly preserved. For some reason too probably because it stains they did not take to picric acid. For this reason we still further modified the procedure by asking that those obtaining specimens of bronchial aspirations gastric fluid rectal mucus ascitic or other fluid and urine immediately add a good quantity of 10 per cent formalin to the material. Formalin is always available and there is no excuse for not using it. This step serves to arrest cellular autolysis and at least begins the process of fixation. When the material reaches the laboratory the technician then adds a quantity of saturated aqueous solution of picric acid filters through filter paper presses the precipitate into the tip of the cone with a rod until it becomes a compact ball and then handles it like tissue by embedding in paraffin.

The results have been most gratifying. Cells of all kinds are well preserved they are concentrated obviating the necessity of long search over wide areas. The Papanicolaou stain can be employed just as successfully as with cells fixed in alcohol-ether. All cells are in the same focal plane and do not overlap one another. A number of sections can be cut and mounted on a single slide assuring an adequate sampling at different levels and affording economy in slides. We have found that for most embedded material less than five minutes is necessary to survey the section under low power and rarely more than ten minutes is required for the high power study. Finally and most important of all groups of cells are not torn apart as is very likely to happen with smearing thus enabling one to see cells in pattern and in relation to their fellows.

Vaginal fluid We generally adhere to the original Papanicolaou technique of making a smear at the time the material is obtained and of fixing it immediately in alcohol-ether. The remainder of the specimen is not discarded

however. It is carefully run into a large calibrated test tube (taped to the bottle for receiving the slide) containing 70 per cent alcohol. Or, if the gynecologist wishes, he may put the remainder directly into the alcohol-ether along with the slide. In either case care should be taken to see that the mass is kept in one piece as it slides into the fluid and that the container be handled gently so that the matter does not break up into small pieces requiring centrifugation which is extra work.

It is true that material obtained by milking out the posterior fornix with the speculum often contains sheets of cells which are probably scraped off with the instrument but this is not a disadvantage because the cells whether normal or abnormal exhibit the continuity that pathologists so much like to have. Even in smears we frequently find such sheets and in the embedded material these are still more common since there has been no opportunity for disrupting them.

Another feature requiring mention has to do with the staining qualities of cellular cytoplasm in vaginal fluids whether fixed *en masse* or in alcohol-ether or precipitated out with picric acid. In material fixed on slides in ether alcohol the cytoplasm of basal cells stain blue to brown but when fixed as tissue the different varieties of squamous epithelium stain red to pink. In our opinion this is not a drawback for one can readily recognize the different types of squamous epithelium by size and nuclear characteristics. When the method is confined to cancer study the staining reaction of the cytoplasm is of no importance.

It should also be mentioned that cells which have been embedded frequently lie on edge rather than flat as in smears. Furthermore it is common to see a clear halo or an apparent vacuole in the flat lying cells. These differences between smears and sections are quickly appreciated and are readily evaluated.

Bronchial mucus To obtain a good biopsy through the bronchoscope is often difficult and in instances where the tumor is inaccessible to the instrument, it is impossible. To the bronchoscopist then any means of obtaining additional information should be welcomed.

Thus far we have confined our observations to secretion obtained at the time of bronchos-

copy and have not worked with sputum which has been expectorated.

The means of collection of mucus is simple. The bronchoscopist saves the content of the trap which may be submitted directly to the laboratory or pours the material into alcohol ether or formalin. In our experience it is difficult to make good smears of thick mucus and we have largely given it up in favor of fixation embedding sectioning and staining with the Papanicolaou stain.

Apparently cells of all kinds are well protected and do not break down quickly in bronchial secretion a feature that does not obtain with gastric mucus, which must be fixed quickly.

It is surprising particularly in embedded mucus, how often sizeable sheets of mucosa or oesophagus are loosened by the bronchoscope and also how frequently one finds masses of bacteria clinging to dead epithelial cells like a swarm of bees. Another surprise is the frequency with which blood pigment laden monocytes are present in bronchial secretion of persons without evidence of heart failure. The bacterial flora also stands out very distinctly. There is little that need escape attention and recognition if it happens to be incorporated in mucus aspirated from bronchus.

It is not difficult to recognize bronchial epithelium whether squamous or pseudostratified columnar in groups or singly. Normal columnar cells cut longitudinally have basally placed nuclei with scattered chromatin granules and coarsely granular acidophilic cytoplasm. The more superficial cells are apt to appear quite broad and flat while the deeper ones are more typically columnar. Cells cut transversely whether singly or in masses, are likely to display little cytoplasm and thus may be mistaken for carcinoma unless weight is given to the uniformity in the size of the nuclei and the amount and distribution of the nuclear chromatin. We have found it easier to distinguish normal bronchial epithelium from carcinoma than it is to differentiate between endometrium and corporal adenocarcinoma.

By the simple procedure outlined we have been able to give valuable aid to bronchoscopists on a number of occasions. Practically always when the biopsy is positive for car-

cinoma the embedded mucus will also contain tumor cells and thus serves as a check. If the biopsy is very small or fails to include enough tumor to make it satisfactory for diagnosis, the help given by cells in mucus is very real.

A recent case will illustrate the point. A patient with an 8 centimeter sized shadow in the roentgenogram of one lung was subjected to bronchoscopy. Nothing was visible in any bronchi accessible to the instrument. A biopsy taken from the orifice of a lateral bronchus of the second order proved to be normal mucosa and submucosa. The mucus aspirated from the affected side contained enough cells to enable us to state positively that bronchogenic carcinoma was present. Pneumonec-tomy was performed and the diagnosis was confirmed both as to the existence of carcinoma and the cell type which had been found in the mucus.

Gastric aspiration. This may be obtained by passing a stomach tube preferably when the viscus is empty or at the time of gastroscopy. The gastroscopist should aspirate either from visible lesions or their vicinity whenever possible. When properly obtained and intelligently handled much valuable information can be gained from a cytologic study of gastric secretion. Heretofore the gastroscopist has had to depend upon visual observation and interpretation. Now a valuable and easily applied adjunct is at his command.

The presence of digestive ferments makes it imperative that gastric mucus be very promptly fixed, either in formalin or in picric acid solution. It is next to impossible to make thin smears of this extremely viscid mucus, and we no longer attempt to do so. Embedding and sectioning on the other hand are very satisfactory.

The cytology of gastric content is both surprising and interesting. It is amazing how often the bulk of cells or even all of them are of squamous type. Presumably these have been swallowed and come from the mouth and esophagus. As with bronchial secretion one often finds that the stomach tube or the gastro-scope detach small and intact segments of gastric mucosa.

Single normal gastric epithelial cells are columnar with clear light pink staining cyto-

plasm and rather dark but small and basally placed nuclei. Cells cut transversely seem to be almost all nucleus but uniformity in size shape and staining reaction differentiate from carcinoma. Gastric carcinoma cells are as readily identified as are those in bronchial or uterine cancer.

Urine Thus far we have studied only known instances of carcinoma of the bladder but have found as have others that the cytologic differences between normal squamous mucosa and carcinoma here is as clear cut as in other locations.

It is most important that only freshly passed urine be employed and further to inhibit cellular disintegration to add formalin solution to the specimen as quickly as possible. Picric acid is equally good if it is at hand.

We do not make smears of urine instead it is precipitated with picric acid filtered and the product embedded.

Rectal mucus Although our experience is quite limited in so far as the study of material derived from other than operative specimens of carcinoma is concerned we believe that because both normal and neoplastic epithelium is well preserved for a time in lower colonic mucus this is another location to which the smear method is readily applicable. Apparently well developed and fungating carcinomas of the colon shed many cells, often in the form of small masses which become incorporated in mucus and are easily found in sections of embedded material (Fig. 11 frontispiece).

Specimens of mucus may be obtained from the examining finger the anoscope or the proctoscope or even from the surface of a formed stool.

The normal cytology is readily established and one soon distinguishes non neoplastic cells by their columnar form uniformity in size and staining reaction of the nuclei just as in the stomach and bronchi.

Transudates and exudates Much time and effort can be saved by the simple procedure of precipitating protein from fluid with picric acid filtration embedding and sectioning.

The concentration of cells so easily obtained by this method enables one to gain a good idea of the cytology in a short space of time. We have found that the Papanicolaou

stain is as much superior to hematoxylin-eosin for cells in fluids as it is for mucus or other material.

It is common knowledge that in actinomycosis demonstration of the organism is not easy after draining sinuses have been established. Heretofore it has been necessary either to search repeatedly for the sulphur granules in pus or to curette the granulation tissue from the sinuses and section it in order to demonstrate the actinomycetes. In a case coming to our attention recently we simply took a quantity of the pus allowed it to drip into picric acid and in sections of the many masses thus obtained it was not at all difficult to find the organism.

The value of the Papanicolaou stain in the recognition of all sorts of normal and abnormal cells cannot be overemphasized. In our hands it has proved to be far superior to other tissue stains chiefly because of the striking sharpness with which the nuclei stand out as one surveys the cells under low power and the really fine nuclear detail brought out by higher magnification. Furthermore the stain is singularly free from technical difficulties and can be done by any tissue technician.

SUMMARY

1 The cytologic recognition of carcinoma in exfoliated material originally described by Papanicolaou is reliable in the hands of experienced cytologists and can be applied to a number of organs and systems of the body.

2 Not only is this method of value in the diagnosis of cancer of the uterus where it was first applied but also to carcinoma of the bladder rectum stomach and bronchus.

3 The method is a valuable adjunct to the bronchoscopist and to the gastroscopist in particular. We believe that the mucus obtained at bronchoscopy and gastroscopy should always be saved embedded and sectioned. In a number of instances already we have been able to make a positive diagnosis of bronchogenic carcinoma from cells found in the mucus when the biopsy was negative or equivocal.

4 A modification of the method of obtaining vaginal fluid which in our hands at least has proved to be easy and workable is described. Concentration of cells saves much

time in study and artifacts are practically eliminated. The Papanicolaou stain can be applied just as readily to such material as to smears.

Addendum. In our work we employ isopropyl alcohol in the ether-alcohol fixation of smears, as a solvent for certain of the stains and as a dehydrating agent. It may be presumed from his writings that Papanicolaou uses ethyl alcohol, although he does not so state.

In general it may be stated that isopropyl alcohol tends to make the cytoplasm of cells stain acidophilic which would be basophilic if ethyl alcohol were used.

When material is initially fixed in formalin, it is most important that picric acid be superimposed. Otherwise the cytoplasm of cells is prone to be deeply basophilic and does

not contrast well with the nucleus, a factor of great importance when the low power microscopic survey is being made.

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TUMORS OF THE CAROTID BODY

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THE first carotid body tumor was removed by Rlegner in 1880 and described by Marchand in 1897. The carotid artery, the jugular vein, the vagus hypoglossal and sympathetic nerves were divided. The patient died on the third postoperative day. In 1866 Madyi and Ger-suny each excised a carotid body tumor with recovery of the patient. The common external and internal carotid arteries were divided in each instance with resulting hemiplegia in the case reported by Madyi. Albert in 1889 excised the first carotid body tumor without sacrifice of major vessels but the tumor recurred within 1 year. Collective reviews by Keen (1906), Reid (1920), Royster (1924), Phelps, Case, and Snyder (1931), Bevan and McCarthy (1929) and Gratiot (1943) have served to point up the many problems relating to the diagnosis and treatment of this disease. From these reviews it is reasonable to estimate that not more than 300 authentic cases of tumor of the carotid body have been recorded.

The carotid bodies first described by Von Haller in 1743 are 2 in number situated near the bifurcation of each carotid artery. Their development proceeds until the age of 20 or 30 years followed by a period of quiescence and finally by sclerosis and atrophy.

They vary in size within narrow limits but usually measure about 5 millimeters in their greatest diameter. The normal gland is gray or reddish brown in color. It is attached by a fine vasculofibrous pedicle to one of the carotid arteries usually the external from whence it derives its nutrient vessel. The structure is encompassed by a fibrous capsule from which projections penetrate the substance of the gland dividing it into lesser lobules.

The individual cells are polygonal; the protoplasm is finely granular and the large oval nucleus contains a small amount of chromatin. The cells generally are arranged in alveolar fashion. Some of the cellular elements exhibit

an affinity for the chromic salts and this feature has invited speculation about their functional relationship to the chromaffin system.

The pathology of the carotid body is limited to tumor formation. These tumors have been designated adenomas, peritheliomas, endotheliomas, hamartomas, paragangliomas, neuroblastomas and more simply, carotid body tumors. With such lack of unanimity regarding nomenclature it seems preferable to employ the latter term.

Grossly the tumors tend to retain the shape, lobulation, and encapsulation of the normal carotid body. They are firm, compressible, slow growing tumors which eventually at times encircle the carotid vessels on the affected side. They vary considerably in size with the largest tumor reported by Reid weighing 190 grams.

Microscopically according to Harrington, Clagett and Dockerty the tumors exhibit two cellular patterns occurring either alone or in combination. One pattern they designate 'alveolar' and the other 'peritheliomatous'. The former is characterized by large islands of pale polyhedral cells separated by a small amount of connective tissue. In the latter arrangement the cellular groups are smaller, irregular, and separated by an abundant vascular connective stroma. Giant and plasma cells may be found as well as areas of degeneration and hemorrhage.

Malignant manifestations such as variation in size and shape of individual cells, mitoses and invasion of the capsule and adjacent structures occur in 15 to 20 per cent of cases (Gratiot). The distinction between benign and malignant tumors of the carotid body may be difficult and it is imperative therefore that adequate biopsy specimens be secured for the pathologist.

Local metastases to regional nodes have been demonstrated but distant metastases suspected in several instances including 2 of our cases have not been verified.

TABLE I — RESULTS

	Expired	Recovery
With ligation (common, internal, and external carotids)		4
With ligation of external carotid artery		2
Without ligation	1	4
Exploration only		4
Subtotal excision		1
Totals	3	5

Carotid body tumors while by no means common are by no means rare. They have two distinctly undesirable qualities. They become malignant in a percentage which while debatable, is disturbing. They occasionally so surround the common external, and internal carotid arteries and are so fused with them that their removal can be accomplished only by ligation of these vessels a procedure which in our experience has associated with it a mortality and morbidity which is forbidding.

While there have been numerous reports on these tumors no one has had large numbers of them to deal with since approximately 300 cases comprise the total number reported in a series of articles reviewed on the subject from 1891 to 1943.

Because of the facts stated we wish to report on 18 carotid body tumors observed at this clinic, to discuss from this experience some of their diagnostic features to make some observations upon their surgical removal and the problems involved to report upon the percentage of malignancies in our series and upon the mortality and morbidity following their removal. As the result of this experience, we would like also to present our position regarding the preparation of these patients for surgery particularly as relates to possible ligation of the carotid vessels and as to when we would or would not attempt removal of the tumor.

The four laterally located tumors of the neck which are single, discrete, and movable in character are branchial cysts, carotid body tumors, single large lateral aberrant thyroid

TABLE II — SYMPTOMS

Swelling	18
Gradual increase in size	2
Pain in neck and/or face	5
Hoarseness	3
Dysphagia	

and neurofibromas. They are found in our experience in about the order stated in frequency of occurrence.

The most frequent differentiation which will have to be made is between branchial cyst and carotid body tumor and while this differentiation will be at times difficult, if not impossible, there are some quite distinguishing features to each of these conditions.

As anyone knows who has operated upon many branchial sinuses, these tracts are superficial in location. They are so superficial that in most instances with traction upon the fistulous opening so often at the level of the cricoid and just in front of the sternomastoid, the branchial sinus tract can be made to stand out so that it can be readily palpated directly under the skin until it disappears under the digastric muscle to connect with the lateral pharyngeal wall in the region of the tonsil. It is for this reason that branchial cysts forming as they do so frequently in the lower half of the tract are so superficial in character and located as a rule well below the level of the division of the carotid and tend as they enlarge to bulge outward upon the neck and become more and more superficial (Fig. 1).

In contradistinction to this, carotid body tumors located as they are in the carotid notch, unlike branchial cysts originate at a higher level and are more deeply located. As they enlarge, they do so upward under the angle of the jaws and at times inward until, as we have seen in 2 of our cases, they bulge into the pharynx and as happened in 1 of the cases, result in interference with swallowing (Fig. 2).

The other single laterally located neck tumor in this region which can be confused with a carotid body tumor is a single lateral aberrant

TABLE III — FINDINGS

	#
Firm mass below angle of jaw	8
Compressible	1
Thrill and bruit	1
Cranial nerve pathology	
hypoglossal	
recurrent laryngeal	

TABLE IV

	Sex		Side	
Male	9	Right		8
Female	9	Left		7
		Bilateral		3

and tumor not verified by exploration in 1 instance



Fig. 1. Both patients have branchial cysts. Note their superficialness, their tendency to enlarge outward and the fact that their greatest diameter is below the level of the carotid notch.

rant thyroid tumor. Lateral aberrant thyroid tissue originating from the ultimobranchial bodies at the beginning of the seventh week of the embryo is set free from the pharynx and develops contact with the two lobes of the thyroid. In occasional cases the ultimobranchial bodies become converted into thyroid tissue and form either a single lateral mass or masses located in front of the sternomastoid muscle along the course of the internal jugular vein. When these are multiple gland-like structures, as they most frequently are, there is no question of their being con-

fused with a carotid body tumor. When however, they occur as a single discrete, laterally located movable tumor mass, as they occasionally do they can and have been confused with a carotid body tumor. Such a single lateral aberrant thyroid tumor occurred in 1 of our patients in whom we removed a carotid body tumor from the other side and was mistakenly diagnosed by one of us (F.H.L.) as a bilateral carotid body tumor until removed and sectioned. These tumors are often fairly deep in location discrete in character movable, and differ from carotid body tumors only



Fig. 2. All three of the patients in this illustration have carotid body tumors. Note that they are of deeper origin,

enlarge inward, and originate higher than do the usual branchial cysts.



Fig. 3. This illustration shows a patient with discrete lateral aberrant thyroid tumor. Note that similar to carotid body tumors this tumor is deep in origin and is situated high, and is often difficult to differentiate from carotid body tumor.



Fig. 4. This illustration shows a patient with a discrete lateral aberrant thyroid tumor which has become malignant. Note that tumors of this type can enlarge superficially and occupy the region usually occupied by brachial cysts.

in that they do not tend to enlarge upward under the jaw (Figs. 3 and 4).

Neurofibromas can of course occur anywhere and in our experience have occasionally been found in the neck. Arising as they do from nerve tissue anywhere, they have as characteristics only laterally located discreteness and movability and no typical features by which they may be distinguished from these other conditions.

While in many cases it is possible to be reasonably sure of the diagnosis of carotid body tumor it is of importance from the point of considering preoperatively the possibility that to accomplish successfully the removal of a carotid body tumor should it prove such, one must always have in mind that ligation of the common carotid internal and external carotid arteries may be necessary. With this possibility in mind and particularly in the light of the experience Drs. Poppen and Horrax in the neurosurgical department of this clinic, have had with 100 cases of intracranial aneurysm with ligation of the internal carotid neck in 75 cases (in 25 cases, intracranial operations were carried out) no one today

considers approaching the exploration of a carotid body tumor without preliminary compression of the carotid on the side of the neck on which the tumor is until by pressure complete obliteration of the carotid for a period of 10 minutes 3 times daily can be endured by the patient with complete absence of symptoms.

In the surgical approach to any single, discrete, movable high and laterally located tumor of the neck we strongly urge that this preliminary carotid compression be employed. We do not believe that it is possible to be certain that any such neck tumor may not on exposure, prove to be a carotid body tumor. If it does prove to be a carotid body tumor requiring consideration of whether or not to interrupt the carotids it at least is some comfort to know that cerebral symptoms do or do not occur with the employment of complete carotid compression for a period of 10 minutes 3 times a day.

TABLE 1.—PREOPERATIVE DIAGNOSIS

Carotid body tumor
Brachial cyst
Tuberculous adenitis
Neurofibroma
Lymphoblastoma

out producing cerebral damage and a fatality, has only relative value. It is of value only when it is positive in the production of symptoms during the compression and has not in our hands proved dependable on the negative side when symptoms are not produced by compression. We have had disaster result when such compression could be borne with no symptoms whatever and so we have placed dependence upon it solely if it is positive and symptoms are produced.

We have employed mechanical compression with the Richard light pressure apparatus and also digital compression endeavoring to be certain of the completeness of the compression by the absence of a temporal pulse and by the complete absence of a carotid pulse when the compression has been of the digital character.

In spite of the fact that such compression could be borne without symptoms fatalities occurred in 2 of 6 patients with carotid body tumor in whom ligation of the common external and internal carotid arteries was necessary in order to remove the tumors successfully. It seems probable to us from this experience that the ability of a patient to withstand carotid compression for 10 minutes 3 times a day is not a dependable indication that the common internal and external carotid arteries can be ligated with safety if it is necessary to do so to remove the tumor. It has value only as evidence should the tumor be malignant or of the type which completely surrounds the common external and internal carotid arteries and will require ligation of all of these vessels. A catastrophe may be expected in a high percentage of cases in which it is done.

Whether this test is or is not dependable as a test of a patient's ability to withstand common external and internal carotid ligation because it is impossible by means of digital pressure or mechanical pressure apparatus completely to obstruct the blood flow through the carotid or because the compression can not be complete for a long enough period for a true test we are unable to say. The fact however that 2 fatalities have occurred in patients who could stand it without symptoms does not give us confidence to ligate the carotids based upon absence of symptoms with this test.

It is to be noted in this series that 4 of these carotid body tumors were completely removed without the necessity of ligating the carotid arteries but that of these 4 cases 1 patient died. An autopsy was obtained in this case and attention should be directed to the finding in this case of one of the dangers in the removal of these tumors even when they can be completely extirpated without the necessity of carotid ligation. Autopsy showed that although the carotid body tumor had been ablated without injury to the carotids a sclerotic plaque had been so displaced from the intima in the manipulation of the vessel that complete carotid thrombosis and a fatality resulted.

From the above experiences what should be the treatment of a carotid body tumor?

The ideal treatment of carotid body tumor is complete surgical excision. The hazards of total extirpation which derive from the necessity of ligating the carotid vessels in approximately 50 per cent of cases in which total excision is practiced is such as to justify not employing this procedure. In an effort to formulate a rational routine of decision in this condition there are certain factors relative to the clinical and pathologic nature of the disease as well as to the risks of surgical excision and the effectiveness of alternative therapy which should be kept in mind.

In approximately 75 per cent of cases the tumor is entirely asymptomatic the presence of the cervical swelling being the only evidence of the disease. The symptoms in the remaining 25 per cent are usually trivial and only rarely are these tumors attended by serious manifestations such as syncope. Finally the lesion grows very slowly in most instances.

Pathologically it is estimated that 15 to 20 per cent of carotid body tumors are malignant. Only Harrington Clagett, and Dockerty disagree materially with this conclusion in reporting an incidence of malignancy of 50 per cent. In the material observed at the Lahey Clinic there was no proved instance of malignancy in the 18 cases.

Malignancy when it does occur is of low grade. Local nodes are invaded but distant metastases suspected in a few cases, have never been verified.

Recurrence is estimated to be 7 per cent, but again Harrington, Clagett, and Dockerty reported 2 recurrences in 8 survivors following excision of malignant tumors of the carotid body a recurrence rate of 25 per cent. It is pertinent to note that these 2 patients lived 8 and 10 years respectively after operation had been carried out.

The consequences of surgical excision are often serious. Phelps, Case and Snyder reviewing 154 proved cases, of which 148 were operated upon, reported a mortality of 24 per cent. The mortality was 30 per cent in the group of patients in whom carotid ligation was necessary. Seven per cent of those who recovered following ligation of the carotid artery had cerebral complications.

In our group of 18 cases 17 patients complained of a swelling in the neck while only 1 victim was unaware of the cervical tumor which was discovered during a routine physical examination. In 13 instances the tumor had gradually increased in size. Five patients had pain in the neck or face 3 experienced hoarseness, and 1 complained of dysphagia. There was a firm tumor below the angle of the jaw in every instance. The two sides were affected almost equally there being 8 tumors on the right 7 on the left and 3 were bilateral. The sexes were likewise affected equally. A thrill and bruit were definitely recorded in 3 cases and in each of these instances the tumor was compressible. Cranial nerve damage was evident in 2 patients the hypoglossal nerve being involved in 1 case and the recurrent laryngeal nerve in another. In 2 patients the carotid body tumor had enlarged inwardly so that it bulged into the pharynx. In 1 of these the intrapharyngeal enlargement was of such extent as to interfere with swallowing and nutrition. This patient an Army officer had had two attempts at removal of the tumor in the Army one by an external approach and one by an approach through the pharynx. Both were unsuccessful and the patient came to the clinic for further trial because of his inability to eat. The tumor was successfully removed by combined external and intrapharyngeal approach. With no attempt to enlarge upon the difficulty of the operation but to record the height to which these tumors can extend

up under the jaw it was finally removed only by detaching it from the base of the skull.

In the 18 cases observed at the clinic, the correct preoperative diagnosis was made in 9 instances an accuracy of 50 per cent. The lesion was thought to be a branchial cyst in 5 cases, tuberculous adenitis in 2 patients, and a lymphoma and neurofibroma, respectively in 2 individuals. It is interesting to record that in 1 patient in whom the clinical diagnosis of bilateral carotid body tumor was made, such a tumor was found at operation on the right and a lateral aberrant thyroid mass was removed from the left. Punch biopsy advocated by some, is unsafe and uncertain.

Generally speaking carotid body tumors cause no subjective complaints. Their growth is so gradual and their presence is so symptomatically benign that patients seek medical care late. In most recorded series the mean duration of symptoms before operation is 6 years and in extreme instances the tumor has been present for 35 years. The duration of symptoms in our cases varied from 3 months to 16 years.

Despite the paucity of symptoms which usually attend these tumors, a wide variety of signs and symptoms may occur. They result from stimulation or invasion of contiguous cervical structures such as the esophagus, pharynx, vagus, laryngeal, or the sympathetic nerves.

Of the 18 patients operated upon at the clinic, excision of the tumor without ligation of the carotid vessels was accomplished in 5 cases. Excision of the growth with ligation of the common internal and external carotid arteries was performed in 6 instances. The external carotid artery alone was interrupted in 2 individuals. The tumor was not excised in 5 patients subjected to operation because complete removal of the growth would have required carotid ligation. Subtotal resection was done in 1 instance, simple exploration in 2 and biopsy in 2 others.

There was 1 fatality in the group of 4 patients in whom the tumor was excised without sacrifice of major vessels, a percentage of 25. Death was due to thrombosis of the internal carotid artery. Two deaths occurred among the 6 patients subjected to ligation of the com-

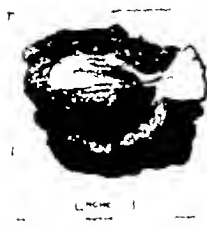


Fig. 5. This illustration and Figure 6 show carotid bodies so surrounding the external, internal, and common carotid arteries that ligation of all three vessels was necessary. Note how completely this tumor envelops all three vessels. It is in this type of carotid body tumor that removal, with the risk involved in ligating all three vessels, is unjustifiable.

Fig. 6. See Figure 5. Note the complete involvement of the vessels (shown with rods in them).

mon, internal, and external carotid vessels a mortality of 33 per cent. The tumors were benign in each fatal instance.

Two of the 4 patients who recovered following ligation of the carotid arteries had temporary hemiplegia with minimal residual symptoms. No mortality attended the group submitted to simple exploration, biopsy, or subtotal excision.

Eighteen patients were subjected to surgery, and there were 3 deaths, a mortality of 16.6 per cent. The 3 deaths occurred in the group of 13 patients in whom the tumor was completely excised, giving a mortality for surgical extirpation of 23 per cent.

The results of alternative therapy are not encouraging. Bevan and McCarthy recorded a good response to irradiation of a carotid body tumor which was explored but not removed, and advocated conservative treatment for benign carotid body tumors whose removal would necessitate the ligation of the carotid arteries. Phelps, Case, and Snyder contrarily state that of 7 proved cases of carotid body tumor treated with x-rays, radium, or both, the patients failed to derive any appreciable benefit from this mode of treatment. Three patients in the clinic series were given radiation therapy with slight reduction in size of the tumor in each instance.

With all of the above facts in mind, we believe that either when the preoperative diagnosis of carotid body tumor has been correctly

made or when such a tumor is demonstrated in exploring a tumor of undiagnosed origin, if the carotid body tumor is found to surround the internal, external, and common carotids completely, removal by ligation of the common carotid and internal and external carotids should be done only when biopsy demonstrates the tumor to be truly of a malignant character (Figs. 5 and 6). Even then it should be removed only when the patient has been able to work up to complete carotid compression for a period of 10 minutes 3 times a day without symptoms, and when friends and family are aware of the risks involved in such a procedure. Ligation of the common, internal, and external carotids when done should be accompanied by ligation of the internal jugular; the patient should be kept in the head-down position and in an oxygen tent for a considerable period of time after operation.

When tumors of the carotid body are small, do not surround the vessels, and can be extirpated without damage to those structures, removal is justifiable. When carotid body tumors in their enlargement project into the pharynx by bulging the pharyngeal wall inward so that they interfere with swallowing, an attempt must be made to remove them. In neither of the 2 cases in this group in which the tumor bulged into the pharynx was there involvement of the carotids, and in both cases it was possible to extirpate the tumor without ligation of the carotid vessels.

In all cases in which the tumor as shown in Figures 5 and 6 so surrounds the carotids that ligation of all these vessels will be necessary the mortality of this procedure is such as not to justify its removal.

It is to be noted that our diagnoses were correct in only 50 per cent of these 18 cases. It is, therefore, evident that some of the tumors thought to be carotid body tumors will prove not to be and that some of the tumors thought not to be carotid body tumors will prove to be carotid body tumors. For these reasons we believe that since aberrant thyroid tumors which can closely simulate carotid body tumors, are frequently malignant and since branchial cysts can so readily be re-

moved and since some carotid body tumors can be demonstrated by exploration to be safely removable all laterally located discrete, and movable neck tumors should be explored.

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THE ROLE OF CHRONIC THROMBOSIS OF THE PORTAL VEIN AND ITS TRIBUTARIES IN THE SYNDROME OF SPLENIC ANEMIA

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THROMBOSIS of the splenic and portal veins and splenic anemia, or Banti's syndrome are often seen together in the same patient. Despite numerous investigations the causal interrelationships of the two processes are still not understood. The problem has assumed new importance now that some relief may be offered to patients so afflicted. Until recently the only corrective measures available for relief of portal congestion in these cases were splenectomy, omentopexy and injection of esophageal varices by means of the esophagoscope. Splenectomy is only partially effective, since it reduces the portal blood flow by only 20 per cent (11). The value of omentopexy and injection of esophageal varices has been equivocal at best and these procedures are rarely used. Most recent efforts to combat portal obstruction are by splenorenal and portocaval anastomosis as advocated by Blakemore and Lord or by extensive gastric resection as described by Baronofsky and Wangensteen.

Splenic anemia or Banti's syndrome, as Banti finally described it in 1910, was thought to be the result of an undiscovered infectious agent brought to the spleen by the arterial blood to produce splenomegaly and passing on to cause sclerosis in the splenic and portal veins and cirrhosis of the liver. The anemia and leucopenia were thought to result from depression of the activity of bone marrow by the toxic agent. The characteristic microscopic finding in the spleen was fibroadenoma or fibrosis of the pulp and Malpighian bodies

with retention of the normal glandlike structural appearance.

Several diseases including Gaucher's disease (9), chronic hemolytic anemia (12) and some forms of leucemia (5, 17) have been segregated as specific entities from splenic anemia while dozens of suggestions have been advanced as to the etiology and pathogenesis of the remaining large number of unsolved cases. We can divide these suggestions into 3 groups each with numerous variations. First is the suggestion similar to that of Banti that the spleen is involved primarily, the changes in the veins and liver occurring secondarily as a result of liberated toxins (13). Ravenna's idea of a primary active congestion in the spleen and Pemberton and Kiernan's idea of an intrasplenic arteriovenous shunt may be included in the first group. Second is the suggestion that the spleen has a secondary rôle. This considers the process either to be a simple obstructive congestive splenomegaly (4, 16) or to be a concomitant manifestation of hepatic disease (9). Third the most reasonable suggestion is that splenic anemia is a symptom complex common to a miscellaneous collection of diseases in which the spleen has either a primary or a secondary rôle (6, 10). These diseases include splenoportal thrombosis, hepatic cirrhosis and chronic infectious splenomegaly.

Several important questions arise when one attempts to decide which of these assumptions is most tenable. What is the actual cause of the splenic and portal venous disease seen in many cases of splenic anemia or Banti's syndrome? It is important to know if these venous changes are secondary to toxins or thrombogenic agents liberated by the spleen, as first postulated by Banti, or if they result from causes completely unrelated to the spleen. If

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Abandonment of part of thesis submitted by Dr. Kelsey to the Faculty of the Graduate School of the University of Minnesota in partial fulfillment of the requirements for the degree of M. S. in Medicine.

Since this study was begun, D. Robertson has died.

TABLE I —CAUSATIVE FACTORS IN CHRONIC DISEASE OF THE PORTAL VEINS (61 CASES)

No apparent cause	3
Possible or proved causes	48
Cirrhosis	0
Abdominal operation	4
Malignant lesion	8
Biliary tract disease	8
Polycythemia vera	5
Pylephlebitis	4
Congestive heart failure	3
Chronic pancreatitis	
Syphilis	
Trauma	
Chronic hemolytic jaundice	
Duodenal ulcer	
Ingested phenol	
Thyroidectomy	
Omphalitis in infancy	
Subacute bacterial endocarditis	
Atherosclerosis	
Total	74
Total cases	6

In several cases (two or more possible causes for involvement of the portal veins) were present.

the causes are unrelated to the spleen does the obstruction and congestion caused by chronic splenic and portal thrombosis produce the splenomegaly? For comparison does the portal congestion encountered in cases of hepatic cirrhosis cause splenomegaly or does pure chronic passive congestion encountered in cases of prolonged heart failure cause splenomegaly? Finally what is the incidence of portal congestion and what are its causes in cases in which the clinical diagnosis is splenic anemia?

METHOD

In an effort to answer these questions we have made a clinical and pathologic analysis of data on several groups of cases in which necropsy was performed. There were 61 unselected cases of chronic disease of the splenic or common portal vein in which the disease had lasted 6 months or longer (62 per cent were males, age range 17 to 82 years). One hundred consecutive cases of hepatic cirrhosis (70 per cent were males, age range 12 to 72 years) were divided into the following groups: 26 with intrahepatic portal obstruction, 25 without evidence of intrahepatic or other portal obstruction and 49 unsuitable for study owing to inadequate data or to the presence of other factors which influenced splenic size. Twenty cases of heart disease were selected in

which the patient had died after 2 or more years of chronic congestive heart failure (males, 65 per cent, age range 17 to 76 years). There were 30 cases with the clinical diagnosis of splenic anemia which after pathologic study still met all the general criteria of Banti (males, 67 per cent, age range, 10 to 62 years).

RESULTS AND COMMENT

Pathology of chronic disease of the portal veins. No clinical or pathologic evidence was found to support the thesis of Banti that chronic disease of the splenic and common portal veins is caused by toxins liberated by the spleen. Instead we found some other positive or probable cause for the chronic venous disease in 48 of the 61 cases. In most instances the cause was unrelated to the spleen. Even in 7 of the 14 cases in which a clinical diagnosis of splenic anemia had been made a well established cause completely unassociated with the spleen could be found to account for the thrombosis.

As Table I shows, there were some cases in which more than one cause was present. For example, several patients who had cirrhosis underwent surgical exploration which involved manipulation of the portal vessels. The surgical procedures were usually for disease of the biliary tract or the appendix but in one case persistent ascites developed 2 weeks after thyroidectomy and at necropsy 2 years later typical chronic thrombotic changes were observed in the portal veins. In nearly all cases of malignant lesions the growth had invaded the veins and secondary thrombosis had occurred. In several instances of disease of the biliary tract inflammation was actually seen to spread from the common bile duct to the portal vein. Similar spread of inflammation to the veins was seen in cases in which duodenal ulcer or pancreatitis was present. Pylephlebitis is usually thought to be a rapidly fatal disease but one of these patients survived for 11 years after an acute phase of the disease to present a classic picture of splenic anemia. Pylephlebitis is probably a more frequent cause of chronic portal venous disease than is realized. Patients who have chronic congestive heart failure usually have an associated abdominal disease which also participates in the formation of thrombi. Omphalitis in infancy may

account for many of the cases of splenic anemia appearing in early childhood

Chronic progressive thrombosis is the most common type of pathologic change in the veins. There were 39 such cases among the 53 in which microscopic sections were available. Without going into the controversy concerning pathogenesis of clot formation these lesions were predominantly thrombotic in 28 cases and predominantly phlebotic in 11.

The thrombotic vessels displayed an extremely chronic intimal thickening. Usually eccentrically placed and constricting or obliterating the lumen, the process arose from intimal proliferation and organization of thrombi. Canaliculi and deposits of iron were usually present to indicate the thrombotic origin of this change. The media was thickened showing a cellular response where there was overlying recent thrombosis. Muscle fibers were replaced in great part by fibrous tissue. The adventitia also was thickened by an abnormal amount of fibrous tissue and free cells. In the phlebotic group the process was predominantly inflammatory characterized by polymorphonuclear cellular infiltration. Thrombotic clots were completely overshadowed by suppuration in 2 cases of protracted pylophlebitis. In addition there were cases depicting all degrees between almost pure thrombosis and almost pure suppuration.

Eight cases fit the often quoted descriptions (7) of phlebosclerosis and were probably the result of ancient thrombosis as evidenced by scarring of the media and adventitia, the presence of canaliculi and iron deposits and the finding in proved thrombosis of venous segments which are identical to phlebosclerosis. Although there was no substantiating evidence in some of these cases the changes may have been the result of developmental stenosis of the portal vessels.

The technical difficulties of vascular surgery and the fertile soil for postoperative thrombosis in most of the cases are obvious. The process was usually progressive with repeated thromboses superimposed one on the other and showed various stages of organization in different segments of the veins. Furthermore in only a few cases was the disease limited to the splenic or the common portal

vein; it usually extended to involve two or more major veins or into the smaller collateral veins obstructing them and exaggerating the portal obstruction. Incidence of venous involvement was as follows: common portal 46 cases, splenic 44, intrahepatic branches 41 and mesenteric, 23.

Cavernomatous transformation was a finding associated with both the thrombotic and the phlebosclerotic vessels and was interpreted as new formed collateral circulation. Neoplastic obstruction was seen in 5 cases. In only 1 case that of an 82 year old man was there a small primary atherosclerotic obstruction which involved the splenic vein. Superimposed terminal thrombosis was seen in 43 cases.

Splenomegaly in chronic splenoportal venous disease. Of the 61 cases of chronic disease of the portal veins, 44 were suitable to study the effect on the spleen of chronic venous obstruction. It was found that 73 per cent of the spleens were enlarged and the mean weight was 685 grams, even though there was an extremely wide range. For those cases in which there was splenic enlargement no cause outside of venous obstruction could be found to account for the enlargement. Associated cirrhosis or toxemia of infection could have caused it in only a few cases. Why then were not all the spleens enlarged? Because several factors in addition to portal congestion influenced the size of the spleen. First the presence of old infarcts with parenchymal destruction definitely prevented enlargement in two or more cases. One of these spleens weighed 35 grams and was composed chiefly of scar tissue. Second there tended to be less enlargement among the older patients owing to their naturally diminished splenic function and blood flow. In 3 cases of complete splenic venous obstruction in which the patients were more than 73 years of age no collateral circulation, splenomegaly or other evidence of portal congestion developed. Third in cases of minimal portal obstruction or well developed collateral circulation there was less enlargement. Fourth and most important was the duration of obstruction for in 11 cases in which the duration could be reasonably determined to be less than 2 years the splenic

TABLE I — CAUSATIVE FACTORS IN CHRONIC DISEASE OF THE PORTAL VEINS (61 CASES)

No apparent cause	3
Possible or proved causes	48
Cirrhosis	9
Abdominal operation	4
Malignant lesion	8
Biliary tract disease	8
Polycythemia vera	5
Pylephlebitis	4
Congestive heart failure	3
Chronic pancreatitis	
Syphilis	
Trauma	
Chronic hemolytic jaundice	
Duodenal ulcer	
Ingested phenol	
Thyroidectomy	
Omphalitis in infancy	
Subacute bacterial endocarditis	
Atherosclerosis	
Total	74
Total cases	6

In several cases two or more possible causes for involvement of the portal veins were present.

the causes are unrelated to the spleen does the obstruction and congestion caused by chronic splenic and portal thrombosis produce the splenomegaly? For comparison does the portal congestion encountered in cases of hepatic cirrhosis cause splenomegaly or does pure chronic passive congestion encountered in cases of prolonged heart failure cause splenomegaly? Finally what is the incidence of portal congestion and what are its causes in cases in which the clinical diagnosis is splenic anemia?

METHOD

In an effort to answer these questions we have made a clinical and pathologic analysis of data on several groups of cases in which necropsy was performed. There were 61 unselected cases of chronic disease of the splenic or common portal vein in which the disease had lasted 6 months or longer (62 per cent were males age range 17 to 82 years). One hundred consecutive cases of hepatic cirrhosis (70 per cent were males age range, 12 to 72 years) were divided into the following groups: 26 with intrahepatic portal obstruction, 25 without evidence of intrahepatic or other portal obstruction and 49 unsuitable for study owing to inadequate data or to the presence of other factors which influenced splenic size. Twenty cases of heart disease were selected in

which the patient had died after 2 or more years of chronic congestive heart failure (males, 65 per cent age range 17 to 76 years). There were 30 cases with the clinical diagnosis of splenic anemia which after pathologic study still met all the general criteria of Banti (males 67 per cent age range, 10 to 62 years).

RESULTS AND COMMENT

Pathology of chronic disease of the portal veins

No clinical or pathologic evidence was found to support the thesis of Banti that chronic disease of the splenic and common portal veins is caused by toxins liberated by the spleen. Instead we found some other positive or probable cause for the chronic venous disease in 48 of the 61 cases. In most instances the cause was unrelated to the spleen. Even in 7 of the 14 cases in which a clinical diagnosis of splenic anemia had been made a well established cause completely unassociated with the spleen could be found to account for the thrombosis.

As Table I shows there were some cases in which more than one cause was present. For example, several patients who had cirrhosis underwent surgical exploration which involved manipulation of the portal vessels. The surgical procedures were usually for disease of the biliary tract or the appendix but in one case persistent ascites developed 2 weeks after thyroidectomy and at necropsy 2 years later typical chronic thrombotic changes were observed in the portal veins. In nearly all cases of malignant lesions the growth had invaded the veins and secondary thrombosis had occurred. In several instances of disease of the biliary tract, inflammation was actually seen to spread from the common bile duct to the portal vein. Similar spread of inflammation to the veins was seen in cases in which duodenal ulcer or pancreatitis was present. Pylephlebitis is usually thought to be a rapidly fatal disease but one of these patients survived for 11 years after an acute phase of the disease to present a classic picture of splenic anemia. Pylephlebitis is probably a more frequent cause of chronic portal venous disease than is realized. Patients who have chronic congestive heart failure usually have an associated abdominal disease which also participates in the formation of thrombi. Omphalitis in infancy may

account for many of the cases of splenic anemia appearing in early childhood

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mean weight was 215 grams while in 31 cases in which obstruction had lasted for 2 years or longer the mean weight was 910 grams.

The histologic appearance of the spleens in most of the cases was uniformly alike and was remarkably similar to that of so called splenic anemia or Banti's syndrome. Fibrosis of pulp and malpighian bodies with retention of normal architectural structure was seen in both large and small spleens. Reticuloendothelial hyperplasia and perimalpighian fibrosis were more common in the larger than in the smaller spleens.

Splenomegaly in cirrhosis and in heart failure Cirrhosis of the liver when associated with portal congestion produces a high incidence of splenomegaly (mean splenic weight, 544 grams). This is shown in 85 per cent of the 26 cases where definite evidence of intrahepatic portal obstruction was found. Portal congestion was determined in these cases by the history of gastroesophageal hemorrhage and ascites and the presence of increased collateral circulation.

McIndoe pointed out that portal obstruction in cirrhosis results from derangement of the intrahepatic portal veins by growth of hyperplastic liver cells. The obstruction may be complete long before hepatic function is appreciably diminished so that in some cases of mild cirrhosis there is severe portal congestion. This was true in 5 of these 26 cases. Four spleens were not enlarged in spite of distinct portal congestion and no cause was found to explain this. Contrary to Rousselot's opinion the degree of obstruction did not always determine the degree of splenomegaly.

Histologic changes in the spleens in most of these cases were similar to or identical with those of chronic portal venous disease or splenic anemia.

In the 25 cases of cirrhosis in which no evidence of portal obstruction was found the mean weight of the spleens was only 281 grams. The lack of obstruction in these cases may be explained in 20 cases by the slight degree of cirrhosis. Since severity of cirrhosis and severity of portal obstruction are usually of about the same degree it is difficult to determine whether the cirrhotogenous toxins acting on splenic parenchyma or the portal obstruc-

tion plays the principal rôle in splenomegaly. Apparently as McMichael believed, both factors play a part. Histologically these spleens usually showed the early signs characteristic of splenic anemia. Some congestion was seen although there was no evidence of it elsewhere in the portal system. Perhaps the short duration of the disease also played a large part in the lack of marked splenomegaly.

Congestive heart failure of long standing failed to produce appreciable splenomegaly (mean splenic weight 194 gm.) even though the histologic changes were those of marked chronic passive congestion and often simulated the picture of splenic anemia. These findings seem to indicate that chronic passive congestion *per se* is not a cause of marked splenomegaly. Perhaps in order to cause splenomegaly the portal pressure must be higher than that produced by heart failure, the congestion must be active instead of passive or there must be a high differential between portal and systemic venous pressures.

Cases in which the diagnosis was splenic anemia In the vast majority of the 30 cases in which the clinical diagnosis of splenic anemia had been made portal congestion was present. From this group with congestion it will be seen that the surgeon may expect to find chronic venous disease in half the cases (14) and cirrhosis in almost as many (11). The 14 cases in which there was venous disease have already been described among the 61 cases in which there was chronic disease of the portal veins. Many of these 61 cases were alike both clinically and pathologically whether diagnosed splenic anemia or not. Also in the group of 100 cases in which there was hepatic cirrhosis the cases with splenomegaly were similar to the 11 cases of splenic anemia with cirrhosis. As previously shown histologic changes in the spleen are usually the same for splenic anemia, cirrhosis and chronic disease of the portal veins.

These findings indicate that the changes form a pattern which may appear in response to more than one cause. When cirrhosis or chronic portal venous disease is manifested clinically by splenomegaly and by anemia and leucopenia as a result of secondary splenic overactivity the diagnosis of splenic anemia

is often made. It is easy to make a diagnosis based on such findings whereas it would be difficult to discover the underlying process.

In 3 instances of splenic anemia there was congestion with no apparent portal obstruction. These may be examples of a unique disease. The hypothesis of Pemberton and Kiernan that the portal congestion is a result of intrasplenic, arteriovenous shunt may explain these cases. Determinations at the time of operation, of blood flow through the spleen may provide valuable information on this hypothesis. The 2 remaining cases of splenic anemia had no portal congestion or obstruction and demonstrate something we must not forget that the syndrome of splenic anemia may be produced in an occasional patient by cause other than portal congestion.

CONCLUSIONS

A well established cause outside the spleen can be found to account for chronic disease of the splenic or portal veins in most cases. No evidence was found which indicated that toxins liberated by the spleen cause the venous disease.

The most common type of lesion in the veins in chronic disease of the portal vein is chronic thrombosis. In the cases of severe so-called phlebosclerosis the condition is the result of ancient thrombosis. Neoplastic invasion occurs in a few instances and atherosclerosis in a rare case.

In the majority but not all of the cases of chronic disease of the splenoportal veins splenomegaly is associated. Several factors other than portal obstruction influence the size of the spleen in these cases. Those which tend to limit the degree of splenic enlargement

are splenic infarction with parenchymal destruction advanced age of the patient well developed collateral circulation and brief duration of the obstruction.

Cirrhosis of the liver often produces splenomegaly and the complete clinical picture of splenic anemia, but the pure chronic passive congestion of prolonged heart failure does not produce splenomegaly.

Splenic anemia is not a specific disease entity. The syndrome can be produced by a number of diseases, the most common are chronic splenoportal thrombosis and hepatic cirrhosis.

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EARLY MOBILIZATION OF PATIENTS AFTER MAJOR SURGICAL PROCEDURES

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THE idea of early ambulation following major surgical procedures is not new. Ries in 1899 was probably the first surgeon to practice this type of treatment in the country. Leithauser and Bergo (6) in 1941 reported a series of 383 appendectomies with an average postoperative confinement to bed of 15 days. In 1943 Leithauser (5) reported 464 consecutive major surgical procedures (including 274 appendectomies) in which all patients were ambulated in the first 24 hours. Schafer and Dragstedt, Ashkins, and Steinhart have added further cases to the long list. There are many reports in foreign literature, one of the more noteworthy being that of Kimbarovsky whose experience covered 551 cases. Many of his patients walked from the operating table.

Since January 1945 we have been mobilizing our private patients early after operation. Excluding hemorrhoidectomies, excision of small tumors, fractures, spine fusions, cases and the like, there were between January 1945 and March 1946 66 unselected consecutive cases of major surgical procedures, following which early postoperative ambulation was carried out. In an attempt to discover any advantages accruing from this method a control series was carefully studied. This control series consisted of 221 consecutive major operations done from January 1944 to January 1945 by the same surgeon whose only variation in procedure after January 1, 1945 consisted in getting the patient up early. The equivalence of factors renders these two series ideal for comparison.

The 1944 group will hereafter be referred to as group I, and the early ambulation group as group II. In both groups postoperative care was well controlled, and 97 per cent of the

patients were followed carefully for periods ranging from 9 to 21 months.

PROCEDURE OF EARLY AMBULATION

Our present method consists in getting patients up 24 hours after operation irrespective of the type of operation. The patient, having a tight binder applied, is elevated to a high Fowler's position and his legs are swung over the side of the bed. He is gently supported to the standing position and assisted to a chair a few steps away where he sits for a period of 15 to 30 minutes. On the second postoperative day this procedure is carried out twice. From then on the time out of bed and the length of the walks are progressively increased. By the fifth to seventh day the patient is walking to the bathroom himself. Sutures are removed on the 5th or 6th day and stay sutures, if any on the 8th day, unless there is some contraindication. Patients having undergone appendectomies and thyroidectomies are sent home by the 5th to 7th day while all others are usually home 7 to 10 days after operation.

Apart from exceptional cases no patient is allowed to be catheterized. If there is difficulty in urination and defecation the patient is allowed up as often as is necessary even on the day of operation.

The rest of the postoperative care needs no detailed discussion here. Careful observations of the pulse and blood pressure, and routine rebreathing and postoperative exercises are carried out while the patient remains in bed. He is urged to cough even though the act may cause discomfort. Fluid and electrolyte balance is well controlled.

A summary of the data on all 487 cases of both groups is presented in Table I. In evaluating the results of this study both averages and medians are calculated. Because a few values fall far outside the normal distribution curve thus distorting average values, standard deviation from the median is used throughout.

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TABLE I.—SUMMARY OF CLINICAL DATA ON 487 MAJOR OPERATIONS

	Average entire series 487 cases	Group I. Late ambulation 21 cases		Group II. Early ambulation 266 cases	
		Average	Median \pm σ	Average	Median \pm σ
Average age of patients	43.4	44.6	46 \pm 6.5	4.9	47 \pm 6.4
Maximum postoperative rise in temperature	-4 C	-4 C	4 \pm 6.7 C	3 C	4 \pm 6.3 C
Postoperative day for maximum temperature rise	4	4	\pm 6.9	3	\pm 6.4
Postoperative day for return of temperature to normal	4.9	6	4 \pm 5.9	4.6	4 \pm 6.8
Postoperative day for ambulation	4.3	9.3	\pm 6.8	3	\pm 6.3
Postoperative day for discharge	5.3	5.4	13 \pm 6.0		\pm 6.7
Complications	8 (3.7%)	8 (3.8%)*		(3.3%)*	
Deaths	20 (4.1%)	(3%)		(1.7%)	

*Standard error of the difference 1.5% actual difference 4.5%

Referring to Table I one finds the median age of group I is 46 \pm 6.5 years while that of group II 47 \pm 6.4 years. The 2 groups studied are thus similar in age.

In like manner it is shown that the figures for maximum postoperative rise in temperature postoperative day for maximum rise in temperature and postoperative day for return of temperature to normal are statistically the same in both groups.

Now in examining the median day for ambulation it is 10 \pm 6.8 days for group I and

σ = Standard deviation of

2 \pm 6.3 days for group II. The difference in the two groups might not seem statistically significant. However reference to Figure 1 shows that group II does not form the normal distribution curve but half of such a curve the peak being along the 1st postoperative day. With group I the peak of the distribution curve is along the 10th postoperative day. Considering this skew the difference in the 2

TABLE II.—CLASSIFICATION OF OPERATIVE PROCEDURES

Operation	Group I	Group II	Total
Hemiorrhaphy			
Inguinal, unilateral	5 (R)	63 (4R)	4
Inguinal, bilateral	6 (R)	(1, 1th one side R)	28
Femoral	4	3 (R)	7
Ventral		8 (R)	0
Lumbar	(R)		70
Cholecystectomies	26 (7*)	6 ()	87 (4)
Hysterectomies	3 (3)	26 (6)	37 ()
Appendectomies	8	4	4
Gastrointestinal operations	8 (9)	3 (0)	4 (8)
Lower gastrointestinal operations	4 (6)	(3)	25 (0)
Thyroidectomies		8	26
Mastectomies	7 (7)	4 (2)	()
Gynecological repairs	3	6	9
	(29)	266 (14)	487 (61)

*Numbers in brackets denote malignancies
R—Recurrent.

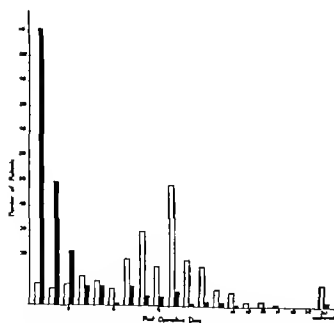


Fig. Group I is indicated by blank area, group II by black area.

TABLE III.

Group I—January 1944 to January 1945

N	Age years	Diagnosis	Operation	Complication	Post-operative day	Result
	30	Pericolic abscess	Drainage of pericolic abscess	Card. failure		Healed, subsequent herniation
7		Chronic cholecystitis with stones	Cholecystectomy with drainage	Abscesses	3	Resolved
3	55	Carcinoma of ascending colon	Resection of ascending colon	Bronchopneumonia, abdominal abscess	25	Resolved
4	51	Gastric ulcer diffuse	Subtotal gastrectomy	Coronary occlusion	3	Resolved
5	54	Bilateral inguinal hernia	Bilateral inguinal hernioplasty	Hemorrhage into scrotum with cellulitis		Resolved
6	57	Chronic cholecystitis with stones	Cholecystectomy with drainage	Disc abscesses	13	Resolved
7	73	Carcinoma of stomach, inoperable	Anterior gastrosplenectomy	Disc abscesses		Resolved
8	67	Incarcerated inguinal hernia	Inguinal hernioplasty	Thrombophlebitis		Resolved
	68	Penetrating duodenal ulcer	Gastric resection	Thrombophlebitis		Resolved
10	54	Carcinoma transverse colon and rectum	Abdominoperitoneal resection	Abscesses, liver Empyema of gall bladder	1	Resolved: gall bladder drained
	44	Chronic cholecystitis with stones	Cholecystectomy	Abscesses	3	Resolved
	8	Carcinoma of stomach	Gastric resection	Wound infection	7	Resolved
3	50	Carcinoma of caecum with metastases	Resection of caecum	Wound infection	6	Resolved
14	70	Acute cholecystitis abscess of pancreas	Laparotomy	Thrombophlebitis	44	Resolved
5	43	Incarcerated hernia	Herniorrhaphy	Bronchopneumonia		Resolved
10	58	Incarcerated hernia	Herniorrhaphy	Thrombophlebitis		Resolved
7	48	Myoma uteri	Hysterectomy	Abscess of abdominal wall	20	Subsequent infection and drainage required
8	6	Indirect inguinal hernia	Herniorrhaphy	Abscesses		Resolved

Group II—January 1945 to March 1946

	36	Left inguinal hernia	Inguinal hernioplasty	Exacerbation of chronic nephritis		Improved
	73	Carcinoma of descending colon	Resection of descending colon, end-to-end anastomosis	Fatal fatality	1	Closed
3	59	Chronic pyelitis	Appendectomy lymphadenectomy	Bronchopneumonia		Resolved
	63	Chronic cholecystitis with stones	Cholecystectomy with drainage	Disc abscesses	4	Resolved
5	73	Carcinoma of rectosigmoid	Resection of rectosigmoid with end-to-end anastomosis	Wound infection	7	Resolved
6	33	Peptic ulcer	Gastrectomy	Renal failure	6	Improved
7	47	Myoma uteri	Hysterectomy	Wound infection	6	Resolved
6	66	Carcinoma of rectum	Abdominoperitoneal resection	Bronchopneumonia	4	Resolved
75		Sarcoma of uterus	Partial hysterectomy	Coronary occlusion		Improved
5		Ventral incisional hernia with fecal fistula	Ventral hernioplasty	Wound infection	7	Resolved

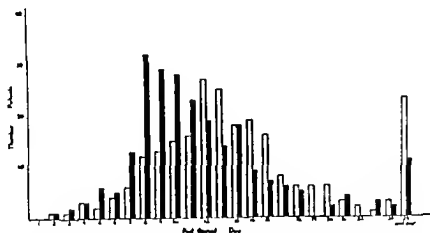


Fig. 2. Group I is indicated by blank area, group II by black area.

groups is greater than could occur by chance, and bears out the claim of early rising for group II.

The median day for discharge for group I was 13th postoperative day ± 8.9 days, that of group II the 11th day ± 8.7 days. This difference could have occurred by chance, but Figure 2 shows the trend towards earlier discharge for group II. The peaks of the curves show a difference of 4 days in day of discharge.

In group I there were 18 complications or 8.5 per cent. and in group II, 10 complications or 3.8 per cent. The standard error of the difference is 2.3 while the actual difference was 4.7 per cent. This difference could have occurred only 1 in 20 times on the basis of chance, and is, therefore significant.

TYPES OF OPERATIONS

Table II indicates the types of operations performed with the number of each. All these cases were done under a combined anesthesia of avertin gas-oxygen-ether.

Hernia. In the repair of all hernias in gural femoral ventral or lumbar, an all silk technique is employed. The wound edges are blocked off with towels as soon as the skin incision is made so as to prevent contamination. The Halsted type of repair is used in both direct and indirect inguinal hernias. Both sides of a bilateral hernia are repaired at one sitting.

Biliary surgery. In cases of biliary tract surgery the approach is through a right paracostal or Kocher type of incision. The wounds are closed with chromic catgut for peritoneum and fascia, with interrupted silk for the skin, and

silver wire as stay sutures. Drainage is maintained for 48 hours.

Laparotomies. Gynecological repairs, thyroidectomies, radical mastectomies complete the list.

As indicated in Table II there were 63 operations for malignant conditions, 34 of which occurred in group II.

Early postoperative complications. Tables III and IIIA reveal not a single case of dehiscence or evisceration either in group I or group II. While wound infections numbered 3 in each group, none of these was among the 179 hernioplasties. There were 4 cases of thrombophlebitis in group I and none among the early ambulation group. Pulmonary complications were 8 in group I as compared to 3 in group II. Coronary occlusion occurred once in each group. Renal complications were more prevalent in group II. One was an exacerbation of pre-existing chronic nephritis after her

TABLE IIIA—SUMMARY OF EARLY POST OPERATIVE COMPLICATIONS

Complications	Group I	Group II	Total
Coronary occlusion			
Renal disturbances			
Bronchopneumonia			4
Dist. ilectasis	6		7
Thrombophlebitis	4		4
Hematomas in wound			
Wound infection	3	3	6
Fecal fistula			
	8		28

TABLE IV—SUMMARY OF 20 POSTOPERATIVE DEATHS

Group I

No.	Age	Diagnosis	Operation	Post-operative day at death	Complication	Cause of death	Postoperative day of death
15	—	Ulcerative colitis	Emergency laparotomy, cecostomy, irrigation of gall bladder	—	Bronchopneumonia	Same	46
30	—	Carcinoma of pancreas metastatic to liver	Cholecystopneumostomy	8	Pulmonary congestion	Same	16
59	—	Acute cholecystitis and cholelithiasis	Cholecystectomy	—	Shock	Same	—
57	—	Inoperable carcinoma of stomach	Laparotomy	3	General deterioration	Same	45
5	68	Inoperable carcinoma of stomach	Laparotomy	8	Carcinomatous	Same	25
6	77	Cystadenocarcinoma of ovary	Excision of ovary	—	Carcinomatous	Same	3
7	57	Richter's carcinoma of rectum	Hemicolectomy	—	Carcinomatous	Same	11
8	90	Carcinoma of head of pancreas	Cholecystopneumostomy	—	Cerebral hemorrhage	Same	14
15	—	Recurrent diverticulitis of colon	Hemicolectomy	—	Acute myocardial infarction	Same	5
10	77	Meckel's diverticulum	Laparotomy	—	Aortic aneurysm	Same	41 operation

Group II

67	—	Periapical abscess with periostitis	Drainage of periapical abscess	—	Bronchopneumonia, fatal	Same	18
77	—	Carcinoma of gall bladder metastatic to liver	Resection of right lobe of liver and of gall bladder	—	Carcinomatous	Same	1
3	77	Strangulated internal hernia	Reduction of strangulated hernia and hernioplasty	—	Cardiac failure, pulmonary	Same	—
—	—	Carcinoma of stomach	Gastrectomy	—	Renal failure	Same	5
1	53	Metastatic carcinoma of liver	Laparotomy	8	General deterioration	Same	44
6	48	Perforated marginal (jejunal) ulcer	Resecting gastroenterostomy and jejunal resection	—	Renal failure	Same	21
7	6	Acute cholecystitis with abscess	Drainage of abscess of gall bladder	—	Pulmonary congestion	Same	3
8	40	Thrombocytopenic purpura	Splenectomy	—	Shock	Same	—
51	—	Duodenal ulcer	Gastrectomy	—	Shock	Same	—
64	—	Perforated duodenal ulcer	Gastrectomy	—	Embolism	Same	—

neoplasia the other was a temporary renal failure after gastroenterostomy.

Deaths. There were 10 postoperative deaths in each group. Tables IV and IVA give a detailed account and summary report of these deaths. It will be noted that 6 patients in group I and 7 in group II died before getting out of bed. In no case can it be shown that early rising would have prevented death. In all 20 cases of both groups 3 patients died from operative shock, 3 from cardiac failure, 2 from pulmonary congestion, 1 from embolism, 6 from carcinomatous and 1 from cerebral hemorrhage. Thus 50 per cent of the

deaths can be classified as cardiovascular deaths.

FOLLOW UP

Of the 487 cases done 467 patients were discharged alive. There were 17 cases (or 3.7%) that could not be followed. The remaining patients were examined and data carefully recorded. Follow up visits were slated for every 3 to 6 months. Table I shows in detail the follow up record—it is evident that 417 out of 450 patients (or 92.7%) had a follow-up of 6 months or more, and 289 (or 64.2%) had a follow up of 9 months or more.

TABLE IVA—SUMMARY OF CAUSES OF DEATH

	Group I	Group II
Operative shock		
Cardiac failure		
Renal failure		
Bronchopneumonia		
Pulmonary congestion		
Embolism		
Cardiomegaly	4	
Cerebral hemorrhage		

TABLE V—FOLLOW UP ANALYSIS OF 450 CASES*

Period of follow-up months	Group I	Group II	Total
1-3	7	66	73
3-6	20	66	86
6-12	37	9	46
Less than 6			33
	209	245	450
Lat. complications†			
Incisional hernia	4	1	5
Recurrence after hernioplasty		2	2
Recurrence of hydrocele			
Keloid formation			4
Late staph. abscess			3
Tenderness in scar			

*20 deaths, and 7 cases (or 3.7%) with no follow-up.

†Small herniations at site of the drain.

‡Preoperative diagnosis: recurrent incisional hernia.

Though a minimum period of 1 year should constitute a fair follow up for herniation to form or reform we believe that most hernias occur or recur within the first 6 months after operation. It will be noted that in group II all hernioplasties were ambulated in the first 24 hours. This group included 4 unilateral recurrent inguinals 3 one sided recurrences in bilateral inguinals 1 recurrent femoral and 1 recurrent ventral. In follow up there was only 1 recurrence in a previously recurrent inguinal hernia as contrasted with 2 recurrences in group I.

Also 4 cases of incisional hernia in group I and 2 small herniations in group II were present at the site of drains.

There were no significant differences in the cosmetic and functional results of the two groups.

EVALUATION OF EARLY AMBULATION

Physiologically early ambulation appears to be sound. Leithauer (5) showed that prolonged recumbency reduces the vital capacity of the lungs, due to reflex inhibition of the diaphragm following abdominal procedures. Churchill and McNeil have expanded upon this point. Standing patients on their feet helps pull down the diaphragm giving better aeration to the lungs. Deep breathing and forced coughing rid the bronchioles of mucous plugs.

Dock believes that the bed pressure on partially filled vessels may cause endothelial changes that give rise to phlebothrombosis with extension from peripheral radicals to

deeper vessels of the pelvis with possible dislodgement of fatal emboli.

Early exercise promotes better circulation and must increase the blood supply to all parts of the operative site. The muscles do not atrophy from prolonged stay in bed and the patient preserves his muscular tone and development.

From the patient's standpoint then his feeling of well being is restored earlier. He does not feel he has been an invalid. He is happy not to have been catheterized and not to have had to use the bedpan. He may have been fearful at the prospect of early rising so soon after operation but became confident after the first trial. Many look back on the idea of early ambulation with approval.

One patient with repair of a double hernia decided that since he was discharged early he could return to work. At the end of 2 weeks he was doing his regular job which included lifting 60 to 70 pounds many times a day. He suddenly realized that he would be ineligible for compensation if he continued so after 3 weeks of heavy labor he stopped work. No ill effects were demonstrable in this patient at subsequent follow up which has covered a period of 1 year.

With the great shortage in hospital beds today the reduction by even 4 or 5 days of hospitalization for each patient is a tremendous

factor in solving this shortage. There is more rapid turnover in cases, which is of interest to the resident staff. The acute shortage of nursing personnel has been alleviated somewhat by early mobilization of patients who are able to take care of themselves early in their convalescence. In the case of those who do not possess hospital insurance the economic advantage of a shortened hospital stay is quite obvious.

SUMMARY

1. Two groups of cases are reported: group I, a control group of 221 consecutive major operations done in 1944 on patients, who were ambulated late; group II, a series of 266 consecutive major operations done by the same surgeon in 1945 on patients who were mobilized 24 hours after operation.

2. There was no significant difference in the postoperative temperature rise nor in the time required for remission of fever.

3. The peak of the ambulation curve for group II was along postoperative day 1 and for group I postoperative day 10.

4. Patients in the early ambulation group are discharged some 4 days earlier than those of the late group.

5. There were 18 complications (8.5%) in group I and 10 complications (3.8%) in group II. The difference is statistically significant.

6. There were 8 pulmonary complications in group I and 3 in group II.

7. There were 5 cardiovascular complications in group I and 1 in group II. No case of thrombophlebitis occurred in the early ambulation group.

8. Not a single case of delirium occurred in either group, although in group II, debilitated patients were subjected to the same early rising routine as the more robust.

9. No significant difference was present in the causes of deaths in either group.

10. There were 97.3 per cent of cases with follow up of which 92.7 per cent were followed from 9 to 21 months.

11. There were 4 cases of incisional hernia in 205 patients in group I or 1.9 per cent; instances in 245 patients in group II or 0.8 per cent. There were 2 cases of recurrences of inguinal hernia in group I and 1 case in group II.

12. The physiological, psychological, and economic advantages of early ambulation are considered.

CONCLUSION

On the basis of this study of 487 unselected, consecutive major surgical cases, early ambulation after operation seems to have no ill effects on the patient. On the other hand, early and late complications are visibly lessened in the early rising group.

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LUNG MOBILIZATION

Its Indications in the Management of the "Captive Lung"

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THE extensive collective experience which surgeons had as a result of the recent war made possible many advances in traumatic surgery. Above and beyond the general advances made in such fields as chemotherapy or blood replacement, spectacular achievements can be pointed out in specialized practices. In thoracic surgery the light shed on reflex changes incident to chest trauma (1, 2, 3), the bold application of decortication or lung mobilization in organizing hemothorax and hemothoracic empyema may be pointed out among others as achievements of high order in this specialized field (3, 6, 8, 11, 12).

The application to civilian practice of lessons learned from military experience is not always easy and certainly thoracic trauma during peace time is not very common but to stop by simply saying that decortication is indicated in organizing hemothorax would be to miss a much more fundamental principle for which lung mobilization was actually used and possibly to exclude from the surgeon's repertoire a useful approach to problems of chest disease. It seems justifiable therefore to consider the maneuver of lung mobilization at thoracotomy in light of its basic indication.

When critically surveyed decortication or lung mobilization was used in military surgery to provide for the expansion and consequent filling of the hemithorax by useful lung. In organizing hemothorax this was accomplished by removing the coat or 'peel' of organizing fibrin which closely invested the visceral pleura and by this mechanical means effectively prevented any increase in pulmonary volume. The applicability of this basic principle to civilian type surgery seems to justify elaboration.

The total number of factors which may influence or to some extent control pulmonary

re-expansion after collapse is in all probability great. However from a practical viewpoint it is believed that they may be subjected to reasonable classification (4). If considered in the abstract, this problem is very complicated but basically involves an increase in volume of the collapsed lung. To accomplish this three circumstances must obtain: (1) Some substance (air) must enter the lung to provide this bulk; (2) the lung itself must be capable of expansion; and (3) the remaining content of the hemithorax (that content which made up the difference between the volume of the collapsed lung and the volume of the hemithorax) must suffer a decrease in volume corresponding to the first proposition above.

This set of circumstances is applicable in the most commonly seen problem of pulmonary re-expansion, namely massive collapse. In atelectasis relief of the bronchial obstruction by permitting the ingress of air satisfies the first proposition; the lung is usually intrinsically capable of expansion, fulfilling the second proposition; and the remaining pleural content is correspondingly displaceable since it is made up mainly of a shifted mediastinum and elevated hemidiaphragm. A situation easier to understand than the example of atelectasis is of course the common and pertinent one of failure of postthoracotomy re-expansion of the lung or postlobectomy re-expansion of the remaining lobe or lobes. Therefore, in attempting to arrive at a more practical consideration of the problem and avoid a tedious discussion of theoretical variants, the following presentation makes the basic premise that the chest wall is functionally intact.

Putting the three basic requirements for pulmonary re-expansion into other words permits the elaboration of the following scheme of influential factors:

1. Bronchial

Defects of the large or segmental branches
Defects of the smaller branches

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- II Pulmonary
 - Defects of the alveoli
 - Defects of the interstitial tissues
 - Defects of combined alveolar and interstitial types
- III Pleural. The presence within the pleural space of
 - Air
 - 1 Simple mantle without tension
 - 2 Due to a bronchopleural fistula
 - a. Nonvalvular defect without tension pneumothorax
 - b. Valvular leak with tension pneumothorax
 - Fluid serous sanguineous purulent etc.
 - Fibrin
 - Pleural investments or distorting pleural symphyses

The bronchial factors are rather obvious and can be brought under the general term of obstruction. Such obstruction may be due to retained secretions, or in postlobectomy lobar collapse, to edema spreading from an adjacent line of bronchial resection or even to distortion of the bronchus, etc. (5-7-10)

The defects of the smaller ramifications of the bronchial tree would also include retained secretions. Their presence in a sufficiently wide area of the bronchial tree to be of significance in a postthoracotomy patient could for example, result from the application of positive pressure by the anesthetist without adequate prior tracheobronchial toilette. The possibility that tracheobronchial secretions may actually be driven beyond easy reach by poorly managed positive pressure anesthesia is probably not as widely appreciated as it should be.

The pulmonary factors are usually not encountered in a recently thoracotomized patient but do assume importance in long-standing collapse. Edema exudate or blood may of course fill the alveoli rendering them airless and heavy and thereby prevent adequate expansion (11). Extensive retention of lipiodol may possibly be operative in this manner (5). Because of prior disease or long-standing collapse under a progressive type of pleural exudate the interstitial tissues may be the site of such extensive fibrosis that they will not permit adequate increases in pulmonary volume (12).

The pleural factors may, of course be varied and many. They all embody however the

idea of preventing increases in pulmonary volume because of their presence and if they are the only factors preventing lung expansion, a direct approach for their correction is not only possible but is usually necessary. Just as bronchoscopy may disclose or remove the bronchial factor so thoracentesis can demonstrate and correct most of the pleural factors.

The presence of a simple mantle of air provides a self-correcting situation because it can be expected to undergo absorption and disappear eventually. A tension pneumothorax, however, is a much less benign situation, but again manageable by well established routine. Certainly a lung cannot expand under an undecompressed tension pneumothorax, but the recognition of this condition poses no unusual problem. The presence of a nonvalvular leak of small size may not prevent eventual lung expansion but will certainly delay it. A tension pneumothorax provides for progressive lung collapse, whereas the nonvalvular leak not only maintains an adverse pleural factor (pneumothorax) but also interferes materially with the efficiency of pulmonary inflation. Even though neutralization of these situations may tax the surgeon's ingenuity to the utmost, such discussion is not within the scope of this paper.

Pleural fluid as a factor probably needs no comment except to point out its significance in being usually associated with some more fundamental pathologic process.

The presence of fibrin or pleural investment or deforming pleural symphyses strikes a new note in this problem in direct application of the lessons learned in the recent war. The presence of fibrin prevents expansion by its bulk, but if it be removed the remaining and probably constantly concomitant pleural coat of organized fibrin will still prevent or greatly delay expansion. This situation provides a lung that may be entirely capable of expanding except for the fact that it is retained or held captive mechanically in the collapsed position by a restricting fibrous investment. That minor degrees of this process in the form of distorting pleural symphyses may greatly delay expansion has previously been pointed out (9).

Returning now to review this problem in its entirety bronchoscopy, clinical evaluation and thoracentesis provide the essential diagnostic as well as therapeutic approaches. Bronchoscopy should reveal and/or eliminate the bronchial factor. Clinical evaluation at least, should reasonably disclose and indicate treatment for a pulmonary factor. Obviously such appraisal may of necessity amount to an extensive investigation but in the recently thoracotomized patient the status of the lung should be well known, either because of the preoperative studies or the information obtained at operation or both. Thoracentesis should permit accurate recognition of most of the possible pleural factors. can correct many of them and should be able to point to proper treatment in all.

A pleural factor not reducible by thoracentesis such as fibrin or the lung which refuses to expand after removal or neutralization of the pleural factor requires thoracotomy for its correction subservient of course to the previously mentioned diagnostic steps by which important and basic etiologic considerations should be elucidated.

It is believed, therefore, that if a patent and normal bronchial tree is present in a lung that



Fig. 1. Case 1. Admission roentgenogram, indicating the extensive left hydropneumothorax which totally covers the lung and greatly displaces the mediastinum toward the right.

has no intrinsic cause for nonexpansibility yet fails to expand after elimination or neutralization of the pleural factor the diagnosis of a captive lung or a lung that is retained mechanically in this state of collapse can be made with reasonable certainty and thoracotomy for its



Fig. 2. Case 1. a, Posteroanterior roentgenogram taken before thoracotomy and decortication. Although the mediastinum has returned to a more normal position, the lung has failed to re-expand significantly, particularly in its apical portion. The evidence of basal loculation is noted and what apparent filling of the hemithorax has occurred is actually due to continued and severe contraction of the chest wall. b, Lateral roentgenogram of same date as a.



Fig. 3. Case 1. Bedside roentgenogram taken 45 hours after decartication. The basal fluid level is the result of accidental occlusion of the posterior intercostal drain. The lung is, however, virtually completely re-expanded.

correction is justified if such prompt re-expansion is not contraindicated on etiologic grounds.

The following case reports will serve as illustrations of the principles which have been discussed.



Fig. 5. Case 2. Bronchogram illustrating the extent of bronchiectasis. Additional projections and more complete left-sided filling are used to clearly indicate the extent of involvement of the upper lobe.

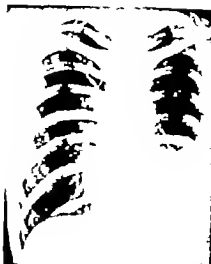


Fig. 4. Case 1. Roentgenogram showing final result. A 1 tercostal incision, as used without rib resection. The left hemithorax is approaching normal volume and good functional result was obtained even though lateral "tenting" of the hemidiaphragm is present.

CASE 1. G. R. B. male white aged 30 years, is referred for treatment with the following history. On November 19, 1945 while sitting at the breakfast table he developed a sudden sharp pain in the epigastrium, accompanied by hoarseness of breath. He was treated by bedrest and given symptomatic care for 4 or 5 days when he was hospitalized. A fluctuation in the left chest was recognized and 200 cubic centimeters of air and 200 cubic centimeters of bloody fluid were aspirated providing some relief. Because there had been no noticeable improvement in the condition of the chest even though symptoms had abated, he was referred for definitive care on December 29, 1945.

The admission x ray film revealed an extensive hydropneumothorax on the left (Fig. 1). This was decompressed and the pleura emptied, requiring partial air replacement for control of negative pressure symptoms. The fluid was thin, bloody and sterile. No acid fast bacilli were found in the pleural fluid nor in the gastric content. There was no sputum and no history of lung disease. Bronchoscopic examination revealed a dry and patent bronchial tree. The pleura was repeatedly aspirated removing air and any re-accumulating fluid (which was negligible in amount) but no indication of pulmonary re-expansion could be detected. Careful manometric readings of intrapleural pressures gave no indication of a bronchopleural fistula. Instead, contracture of the left chest became more pronounced. On the basis of these findings the lung was considered to be "captive" probably on the basis of an investing pleural "coat" or binding pleural adhesions (Fig. 2a and b).

On January 28, 1946 a thoracotomy was performed. The lung was found to be in a state of virtually complete collapse and covered by a "peel" typical of or



Fig. 6 Case 2. Bedside roentgenogram of July 27, 1946. The collapsed lobe is clearly seen, as is the mediastinal shift and elevation of the left hemidiaphragm. A fluid level is present as well as the suggestion of a mass partially filling the pleural space.



Fig. 7 Case 2. Bedside roentgenogram of August 3, 1946. There has apparently been some readjustment of the mediastinum toward its normal position but no increase in volume of the remaining lung. Fluid and the probable intra-pleural mass persist despite all efforts at emptying the pleura.

ganizing hemothorax some 2 millimeters in thickness. Decortication was surprisingly easy and lung expansion full and prompt. His postoperative course was uneventful and he was discharged in a state of full functional capacity (Figs 3 and 4). The site of leak from the lung which had resulted in the spontaneous hemopneumothorax was not recognized at the time of operation.

CASE 2. R M. male white, aged 21 years was admitted on June 12, 1946 for treatment of bronchiectasis for which he had received a medical discharge from military service. A productive cough had been present since 1940, which symptom had appeared following an attack of influenza. Two bouts of hemorrhage had been experienced.

After appropriate study and a suitable period of preoperative preparation (Fig. 5) the left lower lobe and the lingular portion of the upper lobe were resected by individual ligation technique without difficulty on July 25, 1946. Anterior and posterior intercostal drains connected to water seals were employed. The remaining lung inflated in an entirely satisfactory manner prior to closure. The postoperative reaction was minimal and no concern over his welfare was felt until the bedside roentgenogram on July 27, 1946 (Fig. 6) was seen despite the unfortunate emptying of one of the water seals shortly after operation.

Renewed efforts in order to insure adequate evacuation of the pleura were made which included aspiration of the chest, breathing exercises, forced coughing and continuous pleural decompression. Suction on the intercostal catheter was poorly tolerated be-

cause it soon produced acute thoracic discomfort. Sputum was being adequately raised. The fluid obtained from the left pleural space was sterile on culture but was viscid and serofibrinous in character. At bronchoscopy, the bronchial tree was relatively dry, the upper lobe orifice was clearly patent, there being no rotation or encroachment by edema to any significant degree. A curved vertebrated suction tip could be easily introduced into the upper lobe bronchus. No secretions were obtained by this maneuver. Throughout this entire time the patient's clinical course was very favorable despite persistent collapse of the remaining lung (Fig. 7). Thus since the bronchial factor was presumably eliminated there was no known or demonstrable pulmonary factor, no bronchopleural fistula could be demonstrated and evacuation of the pleural content which was as complete as could be tolerated by the patient (checked by fluoroscopy) failed totally in promoting re-expansion of this lobe, the diagnosis of a captive lung or a lung retained in the collapsed position probably by fibrin seemed justified.

Accordingly on August 6, 1946 the thoracotomy wound was reopened. The pleural space was found to contain some residual fluid but a large mass of fibrin comprised most of the volume therein and closely invested the lung which lay totally collapsed in the gutter posteriorly. After manual removal of this fibrin mass a peripleural coat of organized fibrin was recognized and decortication undertaken and carried out fairly completely although its age (only 12 days) rendered it thin enough that some shredding occurred. This procedure was carried out over the



Fig 8. Case . Bedside roentgenogram 48 hours following second thoracotomy. Immediate and very gratifying re-expansion has occurred.

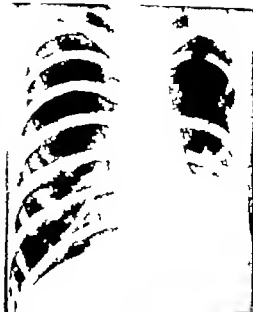


Fig 9. Case . Immediate final result. The basal opacity is due to residuals of the small complicating empyema which required drainage.

entire lung surface including the line of the lingular resection. At the points where this coat came near the stumps of the hilar elements however such intimate dissection seemed more hazardous than was justified even though no doubt complete freeing of the lung base in this area would have been advantageous. Nevertheless this decortication permitted the lung to expand very adequately on increasing intratracheal pressure which was not at all possible before. The chest was closed and the pleura was again drained by an anterior and posterior catheter. The postoperative result was very gratifying (Fig 8) there being prompt expansion of the lobe and progressive filling of the beneath rax by lung. A small basal empyema did develop requiring drainage through the posterior catheter opening.

The patient was discharged with the empyema healed and with only minimal basal residuals visible by roentgenogram (Fig 9).

Neither of these cases would permit the diagnosis of massive organizing hemothorax or fibrinorhax as the usual traumatic case was envisioned (9). In Case 1 the pleural content was aspirable readily and easily the air replacement being necessary for control of negative pressure symptoms only. Case 2 did reveal a residual intrapleural mass by x ray examination in addition to the shadow cast in the roentgenogram by the collapsed upper lobe, but again the bulk of pleural content was aspirable in satisfactory fashion.

Nevertheless these cases illustrate the points in diagnosis required to establish the fact that the lung could not expand because of a retaining pleural factor.

1. There was no evidence of bronchial obstruction.
2. There was no known intrapulmonary factor in Case 2 and no reasonable probability of such in Case 1.
3. The demonstrable pleural factor in Case 1 could be neutralized by aspiration and at least partially neutralized in Case 2 by means of the same method. No evidence of bronchopleural fistula could be adduced in either case.
4. Both patients had a pleural factor reasonably capable of producing a retaining peripleural coat—blood in Case 1 and serofibrous pleural fluid in Case 2.

SUMMARY

1. The factors governing lung re-expansion after collapse are reviewed and a working classification of them is given.
2. The essential points in establishing the diagnosis of a lung that is retained in the collapsed state by pathological peripleural investments are discussed and the relation of this process to organizing hemothorax or fi-

LANGSTON LUNG MOBILIZATION

brinnothorax as seen in thoracic wounds of violence is shown

3 Two cases are reported in which these principles in diagnosis and their effective treatment by thoracotomy and decortication are illustrated

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A NEW ESCHAR TECHNIQUE FOR LOCAL TREATMENT OF BURNS

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THE principal objectives in the treatment of burns have been well summarized by Allen and Koch and by Green and it has been pointed out by them that the primary aim is to save life, and to restore the function and the appearance of the injured individual to as near normal as possible.

Since this article will deal only with the local therapy of the burned area, all of the objectives in the treatment of thermal injuries will not be listed but only those which are directly related to the wound. These objectives are listed below and they should be attained when feasible, by the most efficient the simplest, and least complicated method

1. The prevention or minimizing of shock—a reduction in the plasma volume during the period of shock is prevented by minimizing the internal and external loss of fluid, salts and protein.
2. The relief of pain both the immediate pain and subsequent pain due to dressings.
3. The prevention or minimizing of infection (early and late)
4. The use of a local form of therapy which will not interfere with the patient's recovery either because of undesirable systemic or local effects.
5. The reduction of the external and internal protein and salt loss to a minimum during the convalescent period
6. The induction of healing as promptly as possible or in the case of a third degree burn the preparation of the burned area for grafting at the earliest possible date.
7. The provision of rest for the injured part.
8. The provision of a form of treatment in which the progress of the wound can be expeditiously observed without fear of contamination.

During the past 10 years two methods of treatment have been widely used, namely that of applying a chemical coagulant which forms an eschar (3 5 14) and the method employing petrolatum or an ointment on the burned surface with an overlying pressure dressing (4)

In a recent article, Bettman (6) presented his results on the treatment of over 700 patients with 5 per cent tannic acid and 10 per cent silver nitrate. In his series, the mortality rate was 3.1 per cent and he pointed out that several patients with very severe burns survived (over 70 per cent of the body surface involved). The cause of death in this series could in no instance be attributed to the toxic properties of tannic acid. In a group of patients which the authors regarded as being too small to permit any definite conclusions, Saltonstall, Walker Rhoads and Lee had a lower mortality rate in those treated by the tannic acid method than with pressure dressings. However they also showed by liver function tests that the tannic acid and other chemical eschar methods produced some impairment of liver function which was not evident in the patients treated by the vaseline pressure dressing method. Experimentally these findings have also been corroborated by Clark and Rossiter.

Rae and Wilkinson pointed out that the extent and likelihood of liver damage is much greater when tannic acid jelly is employed than when the tannic acid silver nitrate method is used. The report by McClure, Lam and Romence substantiates this view. The latter group as well as Allen and Koch, showed a significant decrease in the mortality rate when the tannic acid method was abandoned for the nonadherent pressure dressings.

It is not the purpose of this paper to discuss the relative merits of these two forms of therapy but to point out that they are not entirely adequate, at least by a theoretical analysis, and to present a new form of treatment which more completely fulfills the objectives of the local burn therapy here outlined.

METHODS AND RESULTS

On the theory that animal tissue might provide a suitable and effective substance which

would form a more physiological eschar than tannic acid or the other tanning agents do numerous extracts of various tissues were tried. An extract made from beef aorta reacted in the desired way. The protein thus obtained can be used in saline or in an ointment containing glycerine and diglycol stearate (it can also be made with 5 per cent sulfathiazole, or by adding one hundred thousand units of penicillin to 20 to 30 grams of ointment). The purified extract of the beef aorta is a protein, but is apparently free of albumin proteoses and peptones. This extract in the treatment of burns has been under experimental and clinical study for several years and has been used in various vehicles (saline solution or paste containing several different antiseptics). I have employed this treatment in over 500 ambulatory cases and it has also been used in an additional group of over 250 patients with more serious burns by Weller and Zyla.

Judging from these clinical observations and studies on animals, the protein extract from the beef aorta reacts in the following manner:

a. It forms a dry slightly flexible eschar over denuded surfaces of the skin and if necessary can be softened by water or saline solution. This property permits it to be removed very easily without damage to the underlying tissue. Other workers (1, 20, 31, 32) have described similar findings in employing plasma or fractions of plasma for the local treatment of burned areas.

b. The extract in saline solution or made up in the form of a salve containing sulfathiazole sodium 2 hydroxydiphenyl glycerol and diglycol stearate does not injure tissue (7, 10) and shows no evidence of retarding tissue growth. Figure 1 shows a histopathological section taken 6 hours after an application of the protein aortic-extract in an ointment containing 5 per cent sulfathiazole following the removal of the epidermis from the skin of a pig by a dermatome. This section

This extract is prepared by grinding the beef aorta and then washing it to remove the excess blood. The washed material is then extracted with one-tenth normal sodium hydroxide solution for one hour and filtered. The filtrate is reduced to a paste approximately 4. by the addition of dilute hydrochloric acid and the precipitate thus formed is then recovered by filtration. This product then may be redissolved in a physiologic solution of sodium chloride and used as a spray or it can be worked into a paste or ointment.

showed very little reaction in comparison to like sections which were taken after the employment of tannic acid or a vaseline pressure dressing (7, 9).

c. This material can be applied locally by spray or paste or incorporated into fine mesh gauze and a dressing employed (with or without pressure). Since the eschar separates readily when infection or epithelialization occurs, its removal presents no problem.

d. The protein extract with or without added antiseptics adheres to the burned skin surface and remains dry until the wound has healed or the slough begins to liquefy. The same observations have been made by others using a similar method (1, 31).

e. Weeping surfaces show a prompt decrease in the loss of fluid after application of the protein extract, which also occurs when other types of eschars are used (18, 26, 32).

f. It rapidly relieves pain when applied to first, second or third degree burns.

g. If the bandaging method is employed, one application is sufficient, and at any time within a few hours, inspection of the area may be carried out by raising the outer protective dressing. No discomfort is experienced and the lesion is protected from air borne infection because of the eschar. Infected areas can be easily recognized as the eschar liquefies and disintegrates (similar properties have been noted (1, 10, 20, 31, 32) when fractions of human plasma have been used).

h. Gauze impregnated with the ointment will form an eschar which is slightly flexible and capable of withstanding considerable trauma and pressure.

The eschar formed on denuded surfaces with this form of treatment approaches in appearance that which normally occurs when the skin is injured mechanically (32).

If the eschar is broken tissue fluid exudes which promptly closes the opening by forming a scab thus sealing off the wound.

In third degree burns it has been noted that the slough separates at least as early as when other forms of therapy are employed. Since early inspection of the wound is possible, without pain or fear of contamination, skin grafting can be accomplished at the earliest possible date. The extract will not cause any irrita-

tion nor will it firmly adhere to the normal epidermis, hence the outline of the injury is depicted by the adherent protein. When the eschar desquamates from a second degree burned area, the tissue beneath is soft. In a deeper burn as the necrotic tissue separates, the underlying granulations are clean firm and red (Edema of the denuded area is absent or minimum unless infection occurs.) Small areas of infection which may be present in fairly extensive burns can usually be recognized quite early. They can be treated by sponging the area with saline or any water soluble antiseptic and after it has been well cleaned the region can be again covered with the protein extract. The properties of this extract have been tested to determine if it produces any allergic reactions. (The details of these tests will be published later. However no undesirable results have been encountered clinically or experimentally.)

The aorta extract in the form of an ointment or as a solution should be applied to the burned area preferably after it has been thoroughly cleansed.

If the blisters are broken but the wound is clean the injured skin can be pulled over the denuded area. Small unbroken blisters are left intact and large blisters are drained. A method of cleansing the wound by spraying using a standard seltzer bottle to which is attached a rubber tube carrying a DeVilbiss spray head has been used satisfactorily. The cleansing solution which has been found satisfactory is an antiseptic detergent diluting one part of the detergent to ten parts of sterile water. One carbon dioxide capsule may suffice but two capsules will completely empty the bottle at a more satisfactory pressure. The pH of the antiseptic detergent is on the acid side and works well with the aortic extract. Following the use of the antiseptic detergent the wound is flushed with sterile normal saline. If this is not done the eschar usually is too thick. If the eschar becomes too firm this can be relieved by applying an ointment with an oily base. The ointment or solution containing the extract is then applied and the patient is placed in a heat tent or a box splint may be employed for burns of the extremities in ambulatory patients. When dressings are used

the ointment can be applied directly to the burned area which is then covered with fine mesh gauze or it can be incorporated in the gauze which is placed over the burned area. Several layers of dry gauze are then applied and bandaged.

Other observations concerning the therapeutic possibilities of this protein extract are of interest. When it is applied to the early vesicles of herpes simplex, it adheres to the small vesicles which usually desquamate in about 24 hours, leaving a smooth but erythematous area, which will appear entirely normal after the extract is reapplied and desquamation again occurs. An erythema resulting from sunlight or ultraviolet light will be relieved and the pain alleviated if the protein extract is applied early. The flare and accompanying discomfort resulting from many types of insect bites is also relieved in a few minutes following the application of this material, while on the other hand the vasodilation resulting from histamine hydrochloride shows no response to the application of the protein extract. The aortic tissue extract does not delay or accelerate the coagulation of whole blood. However it does delay coagulation of thoracic lymph.

DISCUSSION

In order that the method just described can be evaluated from a theoretical standpoint it is best compared to other forms of treatment in relation to the objectives outlined.

1 The prevention or minimizing of shock—reducing the external and internal fluid loss. Experimental studies have shown that the eschar method (18 26 32) will prevent the external loss of fluids, electrolytes, and protein and that the nonadherent pressure dressing (8 34 36) will reduce the formation of edema in the injured area, if applied early. However local edema without external loss may occur when tanning agents are used, and a plasma-like fluid may seep from the injured surface for days when pressure dressings are employed. Since an eschar which does not injure tissue can be produced and at the same time a pressure dressing may be employed, the protein extract should be the preferable method.

While pressure dressings may be used cotton or mechanic waste have been found to interfere with the formation of an adequate eschar. Because many of the patients exhibit some edema prior to the time the wound is dressed and since pressure dressings are only effective on the extremities the open method or the closed method employing loose dressings are usually used.

2 The relief of pain—immediate and subsequent pain. Following local treatment with all three methods pain is usually readily relieved but since the removal of a tannic acid eschar or changes of a pressure dressing are often uncomfortable the aorta extract is preferable.

3 The prevention or minimizing of infection—early and late. All three methods if carefully employed should be quite adequate. During the first few weeks however when dressings are changed the danger of introducing air borne bacteria should be less when an eschar is present. While there is some controversy over the desirability of applying the sulfonamides or antibiotics locally many workers (2, 25, 27) feel that such therapy is of some benefit. On the other hand Meleney failed to demonstrate a statistically significant reduction in the incidence of infection in a large group of patients that had local applications of a sulfonamide, when compared to a control group of similar cases. However he does state that it seems likely that the use of the sulfonamides may have minimized the spread of the local infection and therefore reduced the incidence of septicemia and death. Whether bacteria can be inhibited or not by such means is not within the scope of this discussion. It should suffice to say that a bacteriostatic substance can be employed with a nonadherent pressure dressing or with the protein eschar method if desired.

The following points should be kept in mind if the sulfonamides are to be employed: (a) They should not be used to replace careful surgical technique (15). (b) They should not be dusted on an open wound in a powder or crystalline form or used in a water dispersible base (15, 16, 24) but should be employed only where a limited slow absorption of the drug will occur. A 5 per cent suspension of



Fig. 1. A histopathological section taken 6 hours after application of the protein aortic extract. A uniform thickness of epidermis was removed from a young pig. Sections were taken from a control animal and when various other forms of treatment were employed. This section shows little reaction in comparison to like sections treated by other methods (7, 28).

sulfathiazole in aortic tissue ointment applied to 13 per cent of the body surface on rabbits subjected to second degree burns and the surface mechanically denuded showed an average blood level in 6 animals of 1 milligram of free sulfathiazole per 100 cubic centimeters of blood in 2 hours, the same in 6 hours and a trace in 7½ hours. The highest level encountered at any time was under 2 milligrams. Levels indicating that the absorption was too rapid were seen when sodium sulfathiazole was used so this was not employed (10).

Since the pressure dressing method has not yet been sufficiently evaluated disadvantages may still become apparent. In Bettman's (6) cases, infection occurred more frequently when a greasy ointment was applied locally. Experimentally (19) the incidence of Curling's ulcer was found to occur more often in animals treated by the vaseline pressure dressing method (66 per cent) than when tannic acid or other eschar forming substances were employed (6 per cent). However the pressure dressing method is not suited for animal experiments and infection seemed to be the



Fig. 2. Case J57. Age 34 years. Subjected to second degree burns of the back, buttocks, posterior thighs, lower half of abdomen and upper right arm, on January 4, 1943, when he fell in bucket of hot water. Child was treated for shock with saline and plasma 3 hours after the accident. Burned area was douches with saline. The cortic tissue extract ointment was applied to the abdomen, the layer gauze. Patient as placed in heat tent, face down, and the tissue extract ointment was applied to the back, buttocks, thighs, and right arm. Eschar formed in 3 hours. Eschar began falling off the 5th day and all areas are completely healed the 14th day (Courtesy of Dr. C. N. Weller).

major factor in causing the high incidence of Curling's ulcer.

4. The use of a local therapy which has no undesirable systemic or local effects. The nonadherent dressing or the protein eschar

method has no known undesirable systemic or local effects. It has been demonstrated conclusively that tannic acid and other tanning agents will cause some impairment of liver function (35). It has also been pointed out (37) that if a patient is placed in a tub containing tannic acid or if the jelly is employed (39) the danger of liver necrosis is a real hazard. Clinical studies (9, 21) and experimental animal work (28) have shown that healing is impaired and some normal tissue destroyed when tannic acid or other chemical coagulants are used.

5. The reduction of the external and internal protein loss. It has been shown (12, 22) that the amount of protein or nitrogen lost externally from a wound may be quite large, and Cuthbertson has again recently emphasized the importance of this loss. For the reasons enumerated in the first part of the discussion the protein eschar method is preferable. Even when the open method is used the edema does not seem to be as great as that observed with other methods. Some studies have been made with the use of this type of



Fig. 3. Case J60. Suffered second degree burns of face, neck, scalp, and ear, January 4, 1943. Wounded area was douches with normal saline. 3/4 hours after being burned with hot gravy. The cortic tissue extract ointment was applied. The eschar was formed in 3 hours. Tissue extract was applied to the chest for the second time January 5, 1943. Lesion was completely healed January 13, 1943. (Courtesy of Dr. Weller).

therapy and although not complete they seem to indicate contrary to what other observers (12-22) have found when pressure dressings are employed that the external nitrogen loss is negligible from the area of a second degree burn.

6 The induction of healing as promptly as possible and the preparation of the third degree areas for grafting at the earliest possible date.

From a study of a limited number of cases it appears that the healing and grafting processes are possibly accelerated when the protein eschar method is employed. The experimental and clinical studies by Hoffman and Dingwall and the observations of others (31-32) help corroborate this impression. Therefore, it is believed that this method can be considered at least as efficient as the nonadherent pressure dressing method.

7 The providing of rest for the injured part. This could be accomplished by any of the three methods of therapy but it should be easier by the protein eschar with dressings or splints or with the nonadherent pressure dressing method.

8 The providing of a form of treatment in which the progress of the wound can be expeditiously observed without fear of contamination.

Experience with the protein extract method indicated that this form of local therapy is superior to the two commonly employed methods. When the vaseline pressure dressings have been used patients with fever and without wound infection have frequently had the dressings removed unnecessarily for examination of the burned area. On other occasions with the pressure dressing or tannic acid eschar methods the infection has spread rapidly and extensively before the wound was observed.

If the protein eschar method is employed the open treatment can be used or if dressings are applied they can be easily removed and the burned area can be inspected frequently. If a small area under the eschar becomes infected it softens or liquefies thus indicating the presence of infection. It can then be cared for early and further spread prevented.

SUMMARY

1 A new method for the local treatment of burns has been described.

2 This method has all of the advantages offered by the other available methods and no known disadvantages.

3 It has been effectively employed in over 500 ambulatory burned patients. Since these patients were not extensively burned no definite conclusions can be drawn regarding the results of this treatment on the mortality rate but there is reason to believe that it should be at least as effective as the other available forms of local therapy.

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PULMONARY EMBOLISM BY AMNIOTIC FLUID

Report of 3 Cases with a New Diagnostic Procedure

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IN 1941 Steiner and Lushbaugh (5) described maternal pulmonary embolism by amniotic fluid thereby adding another entity to the pathology of parturition. DeLee maintained that "The number of possibilities this discovery suggests is uncountable at present and be called it an exquisitely interesting discovery. In most of the cases thus far reported this catastrophe occurs during the course of labor or the immediate puerperium and is characterized by the appearance of sudden profound shock followed by the death of the mother and frequently of the fetus. Postmortem examination reveals no significant gross finding to explain the cause of death. However the microscopic appearance of the lungs is diagnostic. The sections exhibit a relatively bloodless vascular bed in which many of the vessels are occluded by polymorphonuclear leucocytes and the particulate constituents of amniotic fluid (epithelial squamæ mucin granular débris etc.) A variable degree of pulmonary edema may be associated with this condition.

A total of 10 cases was reported by Steiner and Lushbaugh 8 in 1941 (5) and 2 in 1942 (3). No other report of this disease could be found in the literature. Very recently 1 additional case was described by Burt.¹

In this communication we hope to rekindle interest in this condition with the presentation of 3 new cases and a procedure whereby the diagnosis can either be verified at autopsy or perhaps established when autopsy is impossible.

CASE REPORTS

CASE 1: A 35 year old white woman secundipara was admitted to the obstetrical service (Dr. J. W. Stevenson) in active labor 21 days after the expected date of confinement. She had had one pregnancy 8 years previously which was normal. The past medi-

cal history was not significant. The present pregnancy had been normal. Eleven hours previous to admission bloody vaginal discharge appeared followed in 2 hours by the first labor pains 15 minutes apart. About 9 hours later the membranes ruptured spontaneously. On admission uterine contractions were tetanoid in character occurring at 5 minute intervals and lasting 20 seconds. Rectal examination revealed 3 1/2 centimeters dilatation of the cervix with moderate effacement. The fetus was in the left occipitoanterior position of a vertex presentation and had a heart rate of 130 per minute. No significant abnormalities were found on routine physical examination. The blood pressure was 118/76. Temperature, pulse and respiratory rate were within normal limits. The results of urinalysis and serologic tests were negative.

One hour after admission the patient was given demerol, 100 milligrams and scopolamine, grains 1/150 (0.4 mgm.) hypodermically. One hour and 45 minutes later the cervix was fully dilated and effaced. There was an emesis of undigested food particles at this time. Immediately after being placed upon the delivery table the patient became restless and complained of chilliness. The skin was cold and clammy. This was followed by severe hyperpnea and coma. Within 15 minutes the patient was apneic pulseless and intensely cyanotic. There was conjugate deviation of the eyes to the right. The blood pressure was 30/00. Emergency measures evoked no response and death occurred 40 minutes after the onset of symptoms. A dead, cyanotic fetus was delivered during the last 5 minutes by version and extraction.

The autopsy performed 3 hours after death yielded only nugatory gross findings. However, the blood within the heart and vessels was everywhere fluid. No clots were observed. The left and right lungs weighed 235 and 270 grams respectively. There was a small amount of frothy blood tinged mucus in the left bronchial tree. The uterus was normal for its puerperal state. The placenta was not available for examination. The other organs were grossly normal.

Microscopically the arteries and most of the arterioles of the lungs are occluded by a mixture of polymorphonuclear leucocytes, monocytes, acidophilic granular débris, and basophilic fibrillar material, and contain few or no red blood cells. The leucocytes are frequently arranged in parallel rows as though raked or combed. The endothelial lining of the vessels is normal and no leucocytes are found within the vessel wall or in the perivascular tissue. Epithelial squamæ (Fig. 1) and occasional bits of

From the Pathologic Laboratory of St. Joseph Hospital.
While this paper was in press another case report appeared.
Hemmings, C. T. *Am. J. Obst.*, 1947 55 303-306.



Fig. 1. A bloodless pulmonary artery from Case 1 which contains epithelial squames, mucus, and leucocytes. Hematoxylin and eosin stain. $\times 50$.



Fig. 2. A smaller pulmonary arterial branch from Case 1 which contains leucocytes and granular material but no blood. Hematoxylin and eosin stain. $\times 50$.

bile-stained granular debris are present in a few small vessels. The alveolar spaces are empty except for a few which contain a small amount of fluid. The bronchi are normal.

The liver sections show slight separation of the sinusoidal endothelium from the liver cords by albuminous fluid. Sections of the spleen exhibit severe passive hyperemia. Sections of other organs, including the uterus, show no significant abnormality.

CASE 2. A 4-year-old white woman, *tertipara*, was admitted to the obstetrical service (Dr. J. C. Hughes) 10 days before the expected date of confinement. There were 3 normal pregnancies 20 and 22 years previously. The past medical history was essentially negative.

At 6 months of the present pregnancy the patient was hospitalized because of pernicious vomiting and intermittent uterine contractions. At this time she was poorly nourished, moderately dehydrated, and had lost considerable weight. Physical examination disclosed no abnormality other than a mild dermatitis over the anterior abdominal wall. The results of urinalysis and of serologic tests were negative. A moderate secondary anemia was present. After 6 weeks of supportive therapy and bed rest she was discharged much improved and had no recurrence of vomiting.

The patient was readmitted at term with rhythmic contractions every 30 minutes and some bloody vaginal discharge. The fetus was in a vertex presentation with the head at the pelvic inlet. The cervix was thick and 3 centimeters dilated by rectal exam-

ination. Fetal heart sounds were of good quality in the left lower quadrant. The membranes were unruptured. The uterus appeared excessively enlarged and its contractions were strong. Physical examination revealed no significant abnormality. The blood pressure was 120/70, pulse temperature, and respiratory rate were normal. Urinalysis yielded no abnormal finding.

Because of the extensive uterine distention, an abdominal binder was applied, the membranes were ruptured artificially and about 1 liter of amniotic fluid was drained off. During the following 4 hours little progress was made and 6 pitocin injections were given, minimum and 2 minimum doses, alternating every half hour. This was ineffective and labor advanced slowly during the next 24 hours despite a repetition of the pitocin injections. Thirty-four hours after admission she began to have severe tetanoid contractions and made rapid progress. Ten hours later the cervix was fully dilated and effaced. Fetal heart sounds were of good quality at this time. One hour later the patient was delivered of a still-born male infant by outlet forceps under nitrous oxide-oxygen-ether anesthesia. Immediately following delivery the patient became cyanotic, hyperpneic, and exhibited evidence of severe shock. The placenta was delivered without difficulty. The patient became progressively more cyanotic, clammy, and pulseless and died 65 minutes after the onset of symptoms despite immediate antishock treatment.

Autopsy was performed 23½ hours after death. On opening the abdomen, about 300 cubic centimeters of



Fig. 3. A pulmonary artery from Case 3 which is plugged by masses of leucocytes and granular material. Several epithelial squamulae and some rubeus are also present. Hematoxylin and eosin stain $\times 90$.



Fig. 4. A pulmonary artery from Case 3 which contains a hair shaft (lanugo) in addition to leucocytes as well as a small amount of debris. Hematoxylin and eosin stain $\times 140$.

bloody fluid were encountered. There was diffuse bloody extravasation into the preperitoneal tissues of the anterior abdominal wall below the umbilicus. There was also ecchymosis at the root of the mesentery and the mesenteric attachment of the terminal ileum and appendix, extending laterally to the cecum. This ecchymosis also involved the right broad ligament of the uterus with the corresponding tube and ovary. All these tissues were edematous. The blood within the heart and vessels was everywhere fluid; no clots were observed.¹ The left and right lungs weighed 175 and 210 grams respectively and were grossly normal. The liver was normal except for severe pallor. There was moderate dilatation of the left ureter and the left renal pelvis. The uterus was normal for its puerperal state. The placenta was not available for examination. Other organs were normal.

Microscopically most of the pulmonary arterioles and alveolar capillaries are bloodless and are occluded by polymorphonuclear leucocytes and a small amount of granular debris (Fig. 3). Some of the larger vessels are similarly involved. Mucus as seen in Case 1 is demonstrable in a medium sized artery, but no squamulae are seen. The endothelial lining of the affected vessels is intact and the cells are not swollen. There is no indication of leucocytic migration within or outside of the vessel walls.

The liver cells are swollen and the sinusoids narrowed. The latter contain only occasional red blood cells and present instead, many polymorphonuclear leucocytes and monocytes. An occasional small por-

Blood removed from the right auricle was inoculable. It was placed in refrigerator but unfortunately was not examined until weeks later. After centrifugation, the sediment contained, in addition to the usual red cell layer and leucocytic cream, top stratum of white flocculent material. Although shreds suggestive of mucus are found in smears made of this top layer, identification was not positive and the results were considered equivocal.

tal vein shows similar cellular content together with a small amount of acidophilic, granular debris.

No significant abnormality is noted microscopically in the other organs.

CASE 3. A 35 year old white female quintipara was admitted to the obstetrical service (Dr J J Weber) in active labor 1 month prior to the expected date of confinement. There had been 4 previous full term pregnancies 15, 10, 5 (stillborn) and 3 years previously. The past medical history was essentially negative. The present pregnancy was uneventful and the patient entered labor in an apparently healthy state.

The first labor pains began about 8 hours before admission, occurred at 10 minute intervals, and were accompanied by a slight bloody show. On admission the contractions occurred at 5 minute intervals and lasted 30 seconds. Fetal heart sounds were of good quality at 140 per minute. The fetus was in left occipitoanterior position of a vertex presentation. The head was unengaged at the pelvic inlet. The cervix was very soft and dilated 3.5 centimeters. Physical examination revealed no significant abnormalities. The results of urinalysis were normal. The blood pressure was 130/80. Temperature, pulse rate and respiratory rate were normal.

The patient was given demerol 100 milligrams and labor proceeded uneventfully for 6 hours. At the end of this time the cervix was fully dilated and effaced and the head was at the level of the ischial spines. The membranes ruptured spontaneously. It was noted at this time that the amniotic fluid contained fresh blood. Fifteen minutes later the delivery of a normal live infant occurred spontaneously. The third stage lasted 4 minutes and was uneventful. Pituitrin, 1 cubic centimeter was given after the second stage and ergotrate, grains 1/320, (0.2 mgm) after delivery of the placenta. No anes-



Fig. 5. Case 3. In the uterus was found large venous sinus filled with great masses of epithelial squamæ. Hematoxylin and eosin stain. $\times 90$.



Fig. 6. A smear of the top, flocculent layer of blood and mucus from the inferior vena cava of Case 3. A band of mucus characterized by its transparent, veil-like nature shows fine, long parallel fibrils. Wright's stain. $\times 355$.

thetic was administered. For 30 minutes following delivery the patient was alert and communicative. Then there was an emesis of green-tinted fluid. This was followed 5 minutes later by stupor severe by peripheries and coldness and clamminess of the skin. The blood pressure was 40/20. The patient became comatose and pulseless within 15 minutes and respirations were slow and irregular.

At this time about 500 cubic centimeters of bloody fluid were expressed from the uterus and it was believed that shock had occurred from uterine hemorrhage. However blood removed by venepuncture 15 minutes before death had a hemoglobin content of 10.8 grams per 100 cubic centimeters. The plasma protein content was 5.8 grams per 100 cubic centimeters and the hematocrit was 35 by the copper sulfate specific gravity method. Death occurred 1 hour after the onset of symptoms despite antishock treatment.

Autopsy was performed about 1 hour after death. Immediately following the primary incisions and exposure of the abdominal and pleural cavities blood samples were aspirated from the inferior vena cava and from the pulmonary artery. A clean, sterile syringe with a No. 18 gauge needle and clean, sterile specimen bottles with rubber stoppers were used for this purpose.

After autopsy it was felt that death could not be explained on the basis of the gross findings. The uterus was normal for its puerperal state. The placenta and membranes showed no abnormality. There was extensive thrombosis of veins of the broad ligaments. These thrombi were soft of currant jelly type and not attached to the vessel wall. Elsewhere the blood was thin and fluid and no clots were found. The heart weighed 285 grams. Aside from moderate dilatation of the right auricle no abnormality was noted. The lungs were dry and spongy weighing 150

and 80 grams respectively. They were partially collapsed and entirely normal externally and on section. Other organs were essentially normal.

Microscopically there are extensive vascular occlusions beginning with the medium-sized pulmonary arteries and extending down to the alveolar capillaries. The lumina of these vessels are filled with a mixture of loosely packed leucocytes and acidophilic granular material (Fig. 3). Longitudinally-cut hair shafts (lanugo) are found in two of the larger arteries (Fig. 4). This hair is demonstrable in 7 consecutive serial sections of one of these vessels. In 2 smaller arteries the leucocytes appear to be combed-out in parallel rows or lines containing in addition, fine acidophilic granules and a few epithelial squamæ. This "combed-out" appearance of the leucocytes and granules is characteristic of mucus within the vessel. No fat is demonstrable in frozen sections stained with sudan IV.

Although the above findings are present throughout both lungs they are not uniformly distributed. Nevertheless there is very little blood in the pulmonary vascular tree. There is no pulmonary edema. The alveolar spaces and bronchi are empty but in some sections slight atelectasis is present.

In the uterus a very significant lesion is found. A large blood sinus near the endometrial surface contains large masses of epithelial squamæ (Fig. 5).

The liver is noteworthy microscopically because of detachment of sinusoidal endothelium from the liver cords by albuminous fluid with narrowing of the sinusoidal spaces and general ischemia.

Sections of thrombotic veins from the broad ligament show no abnormality of the vessel wall. The thrombi are of very recent origin, show no organization, and no attachment to the endothelium.

No significant abnormality is found in sections of the other organs.

Blood studies The blood aspirated at the beginning of the autopsy did not coagulate. After centrifugation, done within 3 hours after death the sediment showed 3 distinct zones instead of the normal 2. There was a broad more flocculent zone of lighter color above the thin gray layer of leucocytic cream.

Smears were made of the top layer of sedimented material after the supernatant fluid had been removed. These smears were air-dried and stained with Wright's stain and with mucicarmine. The latter stain requires alcohol fixation. The flocculent top layer was then transferred to a small tube and compressed by centrifugation. A portion was fixed in alcohol and the remainder in formaldehyde, and each was embedded in paraffin. The fixed middle, or leucocytic, layer was similarly embedded. Sections were cut and stained with hematoxylin and eosin. Those from the alcohol fixed block were also stained with mucicarmine and phosphotungstic acid-hematoxylin.

Both smears and sections show the bulk of the upper flocculent layer to be composed of finely granular acidophilic material containing widely scattered small clusters of leucocytes. The smears also show occasional, single, long chains or rows of 10 to 20 leucocytes. In one smear of the top flocculent layer of blood from the inferior vena cava, an occasional elongated mass of mucus is found (Fig. 6). The mucus is characterized by its transparent, veil-like nature showing very fine, long parallel fibrils all of which stain pink with mucicarmine. There are many eosinophiles in and about the masses of mucus.

In the sections of the alcohol fixed blood sediment which were stained with hematoxylin and eosin there are small clumps of fine and coarse granules of golden yellow (bile) color. Thin wavy fragments, characteristic of squamæ, are found in the sections but not in the smears. These stain red with eosin and yellow brown with phosphotungstic acid-hematoxylin. (It is to be remembered that the latter stains fibrin blue.)

Smears and sections of the middle zone which consists of leucocytic cream, show no abnormal findings.

DISCUSSION

The work of Steiner and Lushbaugh (5) has established maternal pulmonary embolism by amniotic fluid as a distinct pathological entity which is to be suspected clinically in every case of sudden severe shock during labor or the immediate puerperium. These authors pointed out that this catastrophe is one of the most common causes of death during labor and within the first nine hours thereafter. This opinion was based on an incidence of 1 in 8,000 obstetric cases over a period of 9 years at the Chicago Lying in Hospital. However because the diagnosis was made only in cases in which autopsies were performed the frequency of occurrence is probably considerably greater.

It is an almost incredible but a significant coincidence that the 3 cases reported here occurred consecutively within 1 year in a general hospital averaging 1200 to 1300 deliveries annually and they represent all the maternal deaths on the obstetrical service within that time.

Steiner and Lushbaugh (5) contended that many unrecognized nonfatal cases do occur. Furthermore in patients on whom autopsies were not done it is probable that a sizeable percentage of maternal deaths labeled thrombotic pulmonary embolism, obstetric shock or postpartum hemorrhage are actually fatalities due to pulmonary embolism by amniotic fluid. Even after a postmortem examination it is possible that the disease can escape recognition unless it is kept in mind.

At the present time the clinical diagnosis cannot be made before the appearance of shock. In the cases here reported the patients entered labor with no apparent complication except for moderate hydramnios in Case 2. In Cases 1 and 2 tetanoid contractions were observed late in the second stage. It was noted by Steiner and Lushbaugh (5) that such contractions were a frequent prelude to the shock state. In Case 3 the amniotic fluid contained blood. This supports the theory that the immediate predisposing factor of this disease is a communication between the uterine venous sinuses and the amniotic cavity. Shock occurred suddenly and without warning near delivery or soon thereafter and was irreversible. In 2 of these cases death was attributed clinically to postpartum hemorrhage since much bloody fluid was expressed from the uterus after shock was manifest. However the amount of hemorrhage was small and the hematocrit hemoglobin content and the plasma protein value of the antemortem blood sample in Case 3 were not consistent with exsanguination. The phenomenon of blood in coagulability described in terminal shock (4) was a striking feature in all 3 cases.

The gross findings of the postmortem examination of these 3 patients and of all the cases thus far reported have failed to explain the cause of death. Microscopically the disease is limited to the pulmonary arteries, arterioles and capillaries. The involved vessels are

bloodless and are occluded by emboli consisting of abundant polymorphonuclear leucocytes mucus bile-stained debris (meconium) epithelial squamæ, lanugo hair and granular debris with or without fatty elements. The character of the embolic picture is variable. Which of these materials are present in any given vessel depends upon the proportion of meconium, vernix caseosa and debris in the amniotic fluid and upon the heterogeneous distribution of these elements in the circulating blood. Often enough the vascular obstructions in the smaller branches consist of leucocytes alone. The source of these leucocytes is obscure. Inasmuch as they are also found in great numbers in the larger pulmonary arteries their origin is probably extrapulmonary.

The sections of liver from Cases 2 and 3 show the microscopic picture of serous hepatitis (Roessle) which occurs frequently in cases of sudden death following shock. The liver sinusoids and portal venules of Case 2 contain polymorphonuclear leucocytes and granular material a picture similar to that seen in the lung.

Blood from cases of pulmonary embolism by amniotic fluid removed from the right side of the heart or the inferior vena cava and subjected to centrifugation may show 3 strata in the sediment. The presence of 3 instead of 2 strata should be considered pathognomonic of this condition. The particulate constituents of amniotic fluid including mucus, being of low specific gravity settle out as a flocculent layer above the leucocytic cream. It is recommended that both smears and sections be made of this layer. The sections should be cut from alcohol as well as Zenker or formalin fixed blocks of this sediment. The stains should include Mayer's mucicarmine for the identification of mucus, Mallory's phosphotungstic acid-hematoxylin for the differentiation of fibrin from mucus and epithelial squamæ and hematoxylin and eosin for routine purposes.

The utility of this procedure is twofold. In cases in which permission for autopsy cannot be obtained it may be possible to secure

blood from the right heart by aspiration. The blood examined by the method described may become the only means for a positive diagnosis. In cases in which autopsy permission is granted this procedure serves to re-enforce the diagnosis.

Such postmortem aspiration and examination of blood from the right heart, adopted as a routine procedure in obstetrical deaths, may furnish desirable information regarding the frequency of embolism by amniotic fluid.

SUMMARY AND CONCLUSIONS

Three cases of pulmonary embolism by amniotic fluid are reported. They were characterized by the sudden, unexpected development of irreversible shock during labor or the immediate puerperium, and were followed very quickly by death. At autopsy no significant gross abnormality could be found. Microscopically the diagnosis was established by the demonstration of extensive vascular occlusions by leucocytes and constituents of amniotic fluid in the smaller branches of the pulmonary arteries.

The sediment of blood aspirated from the pulmonary artery and the inferior vena cava of one of these cases showed a pathognomonic, third flocculent stratum above the layer of leucocytic cream. In smears and sections of this stratum constituents of meconium and amniotic fluid are demonstrable.

In cases of obstetrical death, routine aspiration and examination of blood from the right heart by the method described may establish the diagnosis of pulmonary embolism by amniotic fluid when autopsy cannot be performed. In this way the frequency of this condition may be determined more accurately.

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THE PLASTIC SURGICAL CLOSURE OF DECUBITUS ULCERS IN PATIENTS WITH PARAPLEGIA

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THE excision and closure of decubiti in patients with paraplegia by plastic surgical methods is one of the interesting and valuable contributions made by military surgeons during World War II. The first report of bold surgical attack upon an anesthetic bed sore in the paralytic was published by Lamon and Alexander in 1945. However it is stated in the literature that the case cited was housed in the neurosurgical section of the McCaw General Hospital which was under the direction of W. B. Scoville. Many who are familiar with the work of Scoville at the Cushing General Hospital during the recent war feel that priority should be given him for introducing the idea of the surgical treatment of decubitus. Undoubtedly Charcot's concept (1879) of a neurogenic, trophic factor presumed to be responsible for the development of decubitus in denervated areas caused surgeons to hesitate to attack these lesions surgically in civilian practice as well as in military practice in the early years of the war.

As these unfortunate wounded accumulated in Army hospitals during the war Scoville's work became known. Subsequent reports have attested to the value of the methods of plastic surgical excision of decubiti in paraplegics. In 1945 White Hudson and Kennard (15) reported 5 such cases in which patients were treated successfully by excision and the advancement or rotation of flaps of adjacent skin and subcutaneous tissue. Croce Schullinger and Shearer (1946) reported 8 cases in which the decubiti were excised and the defects were closed by the advancement of multiple regional flaps of skin and subcutaneous tissue. Poer

(1946) reported on the incidence of decubiti in patients paralyzed due to war injuries. Forty four (57.1%) of 77 patients with gunshot injuries of the spinal cord had decubiti. Barker Elkins and Poer (1946) reported their results in 70 cases in which decubiti were treated by simple excision and suture by rotation flaps or by the free grafting of skin. White and Hamm (14) (1946) published their experiences with 14 decubiti in 9 patients treated by simple excision and closure or by sliding flaps. Gibbon and Freeman reported on the operative closure of 65 ulcers in 43 patients.

Much information has been gained from a study of these reported groups of cases. The organized plan of the United States Army Medical Department for the care of paralyzed individuals as outlined in Poer's publication has resulted in obtaining the maximum benefit of neurosurgery for these patients, and a high percentage of them have been spared the serious complications of the genitourinary tract. They have been benefited by exercise by physical therapy by general supportive measures and some have been completely rehabilitated. Many of these patients have now been transferred to Veterans' hospitals where they continue to receive the benefits of physical therapy and are undergoing rehabilitation. The closure of long persistent or recurrent decubiti in these chronic cases is the present problem of paramount importance. The continued loss of protein and nitrogen from open wounds is the causative factor underlying the debility of the patients. The excellent studies of Mulholland and CoTu, Wright Vinci and Shafiroff demonstrated that in patients with decubiti, the plasma protein concentrations invariably are below normal and that a negative nitrogen balance exists.

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Read before the Surgical Section of the New York Academy of Medicine, February 7, 1947.

Because the surgical treatment of decubiti in paraplegics involves the transposition of soft tissues supplemented occasionally by the use of free grafts of skin this surgery has been the responsibility of the plastic surgeons. At the Veteran's Administration Hospital in the city of New York there have been 65 patients with paraplegia, 59 of whom have had 298 decubiti. This report deals with the surgical management of these patients. Their ulcers have been of long duration resistant to conservative treatment and in a few cases recurrent after surgical excision and repair. In comparison with the reports referred to above it is apparent at once that the decubiti in this group of patients are of longer duration than those encountered in Army and Navy hospitals during the war. Included in this group of patients are those who have failed to be rehabilitated physically and mentally some who have been lacking in morale and in co-operation and a few who have developed harmful habits such as alcoholism. Despite these circumstances the results following surgery have been gratifying.

ETIOLOGY

There is general agreement that pressure over osseous prominences such as the trochanter the sacrum or the anterior superior spine is the most important single factor in the development of decubitus. Compression of the soft tissue overlying bone causes local anemia which if sufficiently prolonged results in necrosis. Also there is general agreement that old age general debility avitaminosis malnutrition and anemia are contributing factors.

However there is difference of opinion regarding the pathogenesis of decubitus in paraplegia. Gibbon and Freeman basing their conclusions on the work of Brown Sequard, Paget and Cohnheim feel that neurogenic factors are not responsible but that decubiti in paraplegics are due to continued local pressure associated with loss of motion and of muscle tone. Munro elaborating on the neurogenic theory first advanced by Charcot, feels that the development of a decubitus in a paraplegic is dependent on the effect of abnormal vascular reflexes caused by disturbance of the

sympathetic nerves of the area. He points out that in his series of cases with injury to the thoracic and lumbar spinal cord the incidence of bedsores was 54 per cent while in the cases with injury to the cervical cord the incidence was only 20 per cent. He states that there is failure of the proper response of circulation of the skin to its varying needs and that this failure is due to a reflex of the sympathetic nerves. According to this theory spinal shock, present immediately after injury affects the peripheral vasomotor reflexes with the failure of development of increased regional flow of blood which is necessary for proper nutrition of the part. However Munro agrees that all bedsores start as pressure sores and may be prevented by turning the patient hourly by regular massage by keeping the skin dry and by the use of powder. MacCollum feels that pressure causes a local diminution of blood supply resulting in necrosis of the skin and underlying tissues. Boyd calls the condition a pressure gangrene which is influenced by a devitalized condition of the tissues as a result of old age long illness, or of hypostasis secondary to feeble circulation. In spinal cord lesions, he believes that capillary stasis from injury to vasomotor nerves is a contributing factor.

PATHOLOGY

In the early stages of decubitus, continued pressure produces thrombosis of small blood vessels. In the affected area a reddish patch appears which soon changes to a dusky color and necrosis follows. Slough separates gradually to leave a granulating surface. The granulation tissue of the ulcer is infected and is grey in color. As the ulcer increases in size the slough extends farther in subcutaneous areas than in the adjacent skin so that one may be deceived concerning the size of the lesion. Also the ulcer extends toward the deeper layers of tissue so that eventually the underlying bone is exposed. The appearance of the base and the undermined sides of an ulcer of long duration gives the impression of an open sac with a smooth lining. Photograph of a specimen of decubitus ulcer which was excised at operation is shown in Figure 1. The specimen has the gross appearance of a cyst



Fig. 1 Specimen excised from a patient with decubitus over the trochanter of the femur. Note the cyst-like character of the lesion.

with a relatively small opening through the skin. Its thick walls consist of fibrous tissue and its lining is of smooth grey avascular granulation tissue. On microscopic section it is observed that the smooth appearance is due to a lining of necrotic tissue and pus superimposed on an area denuded of skin. The underlying and adjacent connective tissue is edematous but well vascularized. There is infiltration of polymorphonuclear leucocytes, lymphocytes, and plasma cells with occasional histiocytes. The arterioles have thick walls. There is proliferation of fibrous tissue throughout. The capillaries and venules are dilated and engorged. Undoubtedly this stasis of blood contributes to the extension of the ulcer. Photomicrographs of ulcer tissue are shown in Figures 2 and 3.

BACTERIOLOGY

The causative organisms assume an important rôle when the appearance of the ulcer indicates spreading infection and when there is evidence of systemic reaction. The necrotizing skin and underlying tissues are contaminated with bacterial flora of the skin and intestinal tract. These invade the deeper tissues as the process extends. The presence of anaerobic streptococci may cause an inflammation which progresses rapidly with resultant extensive gangrene. Careful anaerobic and aerobic cultures should be taken in such



Fig. 2 Low power photomicrograph of the edge of a chronic decubitus. The marginal epithelium is embedded in dense fibrous tissue.

cases so that specific treatment may be instituted immediately after excision of the gangrenous tissue. Also it is advisable to deter

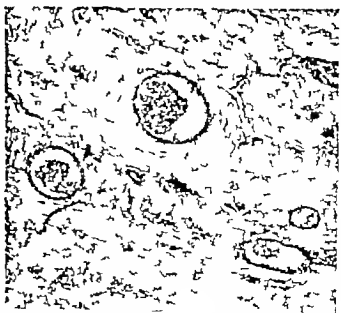


Fig. 3. High power photomicrograph of tissue from the floor of a decubitus of 12 months duration in a patient with paraplegia due to gunshot wound of the spinal cord. Marked capillary dilatation and stasis is in evidence.

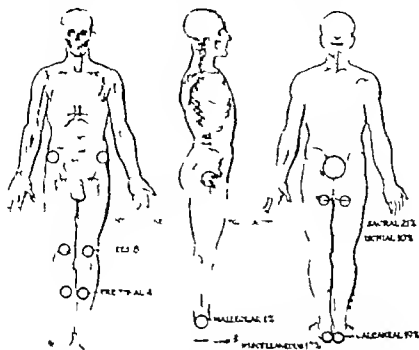


Fig. 4. Diagram showing the locations of 398 decubiti in 50 patients with paraplegia due to war injuries.

mine the susceptibility of the causative organisms to penicillin, to streptomycin and to the new antibiotic bacitracin.

In the indolent ulcers one finds a wide variety of organisms. Anaerobic and aerobic studies were made of the flora of the ulcers in 18 cases in this series. A variety of organisms were reported in the following order of frequency: staphylococci (usually coagulase positive), *Bacillus proteus*, *Escherichia coli*, *Bacillus pyocyaneus*, diphtheroids, hemolytic streptococci and nonhemolytic streptococci. In addition in 9 of the cases the anaerobic plates showed the pinpoint colonies of microaerophilic streptococci. Bacteriologic studies made by Gibbon and Freeman and by White and Hamon (14) revealed similar findings. In the cleansing of an indolent decubitus ulcer in preparation for surgery the frequent change of saline compresses has been found to be most useful.

Specific types of infection have called for specific local therapy. Dressings of zinc peroxide have been very effective in clearing up areas where there was gangrene of tissue in association with anaerobic organisms. Appli-

cation of parachlorophenol has been used effectively to combat heavy growth of the *Bacillus pyocyaneus*. Nine-amino acridine hydrochloride is effective against most of the other organisms which have been recovered from decubiti in this series of cases.

PREOPERATIVE AND POSTOPERATIVE CARE

In preparation for surgery a high caloric diet with extra nourishment is given in an attempt to restore a positive nitrogen balance. Transfusions of blood, of plasma, and protein digests are indicated for the treatment of hypoproteinemia and anemia. Vitamins (B complex and C) liver extract and iron are administered. Patients with good appetite and steady gain in weight are considered to be ready for operation. Only those patients in whom complications of the urinary tract have been avoided or controlled are subjected to operation.

Many of the patients in this series demonstrated involuntary spasms of skeletal muscles. In several such cases these spasms constituted a factor which contributed to the development of complications in the wounds.



Fig. 5 a, above, Small decubitus over the anterior superior spine of the ilium in a patient with transection of the spinal cord. t the level of twelfth Thoracic. b Result after elliptic excision of the decubitus and linear closure of the defect. This method was found useful only in the management of small ulcers. It was successful in 74 per cent of the cases in which it was used.

following surgical closure. Such spasms have resulted in partial or complete separation of the edge of a wound and in a few of these cases bursae have developed under the flaps of soft tissue. Therapy with penicillin and sulfonamides is given for 24 hours prior to operation. The preparation of the wound includes daily cleansing with saline sponges and the application of a fine mesh gauze impregnated with xeroform ointment. Slough is excised at the time of each dressing. Specific infectious agents require the use of specific local therapy as mentioned above. Cleansing enemas are given prior to operation.

In the care after operation the measures described in the preparation for operation are continued. Penicillin is administered throughout the postoperative period. The position of

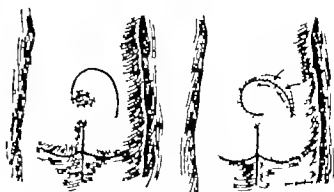


Fig. 6 Diagram of the method of excision of decubitus ulcer and closure by pedicled flap.

the patient when returned to bed must be supervised carefully. The success of surgery depends upon the avoidance of those factors which in themselves contributed to the development of the original decubitus. The patient must be moved from side to side and from prone to supine. It is inadvisable to allow the weight of the body to cause pressure over the operative site until the wound is inspected at the time of the first dressing. Gross soiling of the operative area is prevented by the use of a retention catheter by administration of a low residue diet and by the giving of liberal doses of paregoric. Enemas are withheld until the 7th postoperative day. The first postoperative dressing is done on the 6th, 7th or 8th day after operation at which time alternate sutures are removed. The last sutures are not removed until the 14th day after operation. Collections of fluid or clot are aspirated and solution of penicillin is instilled.

STATISTICS

Sixty five patients with paraplegia are included in this analysis. Fifty nine of these have had 298 decubiti. Six patients had no pressure sores. Of these 59 patients all but 3 had unhealed decubiti at the time of admission to this hospital. Forty nine had multiple decubiti while only 10 patients had a single decubitus. Six of these patients had lesions of the cervical cord. 53 had lesions of the dorsal or lumbar spinal cord. Of those with lesions of the cervical cord 3 exhibited multiple ulcers. 1 patient had only 1 ulcer and 2 patients had none at all.

Of interest is the location of the 298 decubiti which occurred in the 59 patients (Figure 4)

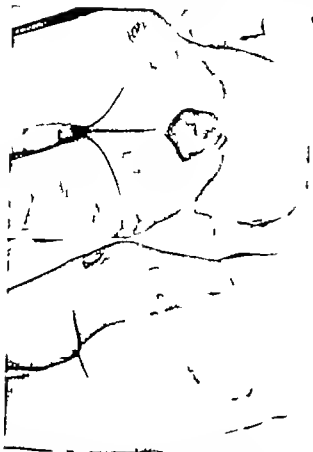


Fig. 7 a, above, Appearance of chronic decubitus over the sacral region in a patient with paraplegia due to transection of the dorsal spinal cord. b, Result after excision of the decubitus and closure by rotation of pedicled flap with primary closure of the defect created by the construction of the flap. Objection to this method is based on the fact that tension at the line of suture laterally may be reflected to the medial line of suture which resides close to the site of the original decubitus. This method was successful in 62.5 per cent of cases in which it was used.



Fig. 8 a, above, Decubitus of left buttock in patient with paraplegia due to gunshot wound of dorsal spinal cord. The relatively small external opening with deep extension into the underlying tissue was common characteristic of the decubiti over the ischial tuberosities in the group of cases included in this report. b, Appearance after excision of the ulcer and sinus and closure by advancement of flap from neighboring tissue as shown in Figure 6. This method was successful in only 62.5 per cent of the cases in which it was used.

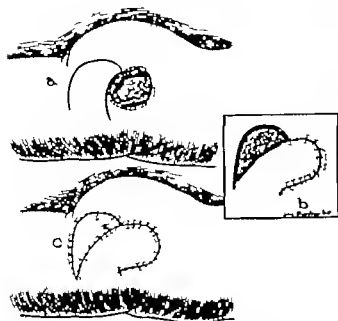


Fig. 9. Diagram of the method of excision of decubitus and closure by pedicled flap with free thick-split graft at a distance. The method has the advantage that lines of suture are without tension and do not reside over the area of primary decubitus. The free graft effectively provides a permanent surface for the soft tissues underlying it. This method was successful in 75 per cent of the cases in which it was used.

osity, the tibia, and the anterior superior spine have been operated upon (Table I). The largest ulcer encountered in this series of cases was 12 by 15 centimeters. In a few cases the ulceration was quite small but often such an ulcer represented the opening of a deep sinus. In one case such a sinus with an opening only 1 centimeter in diameter was found to extend to a depth of 14 centimeters. Forty or 71 per cent are healed following surgery. In these patients the ulcers had been present for an average time of 12 months. In 16 or 29 per cent the ulcer persisted or recurred following excision and closure. In these patients the average length of time between the onset of the ulcer and the date of operation was 15 months.

OPERATIVE TREATMENT

The operative treatment of decubitus consists of the complete excision of the ulcer and adjacent scar and the covering of the defect with an adequate pad of healthy tissue. By this is meant a covering of skin with a thick layer of subcutaneous fat. Usually this can be advanced from surrounding tissues but con-



Fig. 10. a, above, Decubitus of 10 months' duration over the trochanter of a patient with paraplegia due to gunshot wound of the spine at the level of the 4th thoracic segment. Fragmented bone was exposed in the base of the ulcer. b, Result after excision of decubitus and closure by pedicled flap with free thick-split graft at the site of elevation of the flap. Note that by the use of this method the graft resides permanently over soft tissues, not over a bony prominence.

ceivably might be transplanted from a distance.

The complete excision of the ulcer may be a difficult technical procedure. Ulcers of long duration are surrounded by a dense layer of scar and usually the ulceration has undermined the regional soft tissues extensively. Subcutaneous excavation of the ulcer may extend as far as 14 centimeters beyond the margins of the ulcer itself. Ulcers over the trochanter or ischial tuberosity often are associated with fragmentation and necrosis of bone necessitating partial osteotomy as a step in excision of the ulcer. Because of the profuse bleeding from scar tissue at the time of excision it has been our practice to administer a

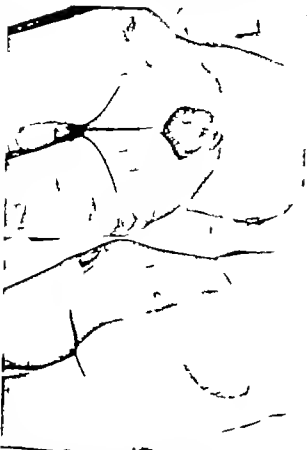


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The most frequently encountered decubitus was that of the sacral region. Sixty three (21 per cent) were in this area. There were 57 (19 per cent) ulcers over the trochanters. Also there were 57 (19 per cent) over the os calcis. It is of interest that 26 patients had ulcers

over both heels while only 5 showed ulceration over only one heel. With one exception these ulcers responded to conservative therapy healing spontaneously. There were 30 ulcers (10 per cent) over the ischial tuberosities, 23 ulcers (8 per cent) over the knee, 19 ulcers (6 per cent) over the anterior superior spine of the ileum, 11 ulcers (4 per cent) in the pretibial areas, and 38 ulcers (13 per cent) were distributed in various areas of the paralyzed torso or extremities.

An analysis of those cases in which the ulcers were treated by excision and plastic surgical closure is of interest. Thus far 56 ulcers over the sacrum the trochanter the ischial tuber

TABLE I.—STATUS OF 298 DECUBITI
IN 59 PATIENTS

	No. ulcers	Per cent
Healed by conservative treatment	89	63.4
Unhealed at time of this analysis	53	7.7
Healed following excision and closure	40	3.4
Persistent following excision and closure	4	4
Recurrent following excision and closure	4	3
Total 298		

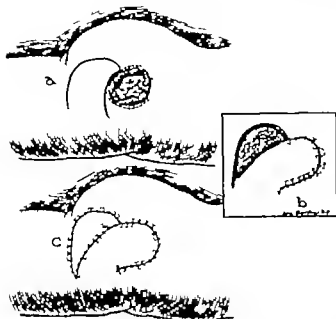


Fig. 9. Diagram of the method of excision of decubitus and closure by pedicled flap with free thick-split graft at a distance. The method has the advantage that lines of suture are without tension and do not reside over the area of primary decubitus. The free graft effectively provides a permanent surface for the soft tissues underlying it. This method was successful in 75 per cent of the cases in which it was used.

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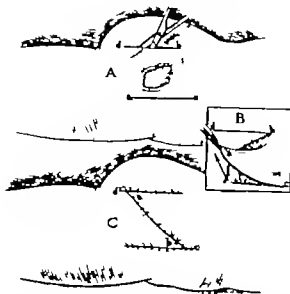


Fig. 1. Diagram of the technique of excision and closure by Z-plasty. Because the defects following excision of decubitus usually are quite broad this method of closure is not considered to be ideal. It is successful in only half of the wounds to which it was applied.

transfusion of blood during the operation. Hematoma as a complication may lead to failure of the operative effort. Therefore emphasis must be placed on accurate hemostasis. Electrocoagulation has been used for this purpose but the authors feel that its use is not ideal since it leaves traumatized or necrotic tissue in the wound. Its use in this series of cases was followed by excessive accumulation of serum in the wounds. Hemostasis is effected best by the use of mosquito clamps and fine ties of No. 00000 plain catgut or No. 120 cotton.

The operative procedures which have been used in the 56 operations in this series are 5 in number. These procedures are based upon established principles of plastic surgery. They are as follows: (a) elliptic excision and closure; (b) excision and closure by Z-plasty; (c) excision and closure by pedicled flap; (d) excision and closure by pedicled flap with free graft at a distance; (e) closure by free skin graft. Emphasis has been placed on the necessity for covering the site of ulceration with a generous flap of tissue and without scars of suture overlying the original site of ulceration. To accomplish this a free thick split graft of skin at the site of procurement of the flap has

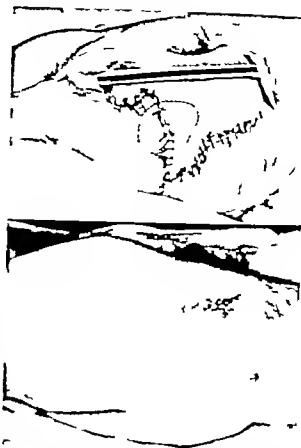


Fig. 2. a, above, The dotted circle represents the size of the derubritus over the trochanter in this case. The lesion is present 1 month. It is excised and the defect closed by Z-plasty. b, Appearance 3 months after excision of the decubitus and closure by Z-plasty.

allowed for its rotation or advancement without tension. Free grafts applied directly to the decubitus have been used only in those cases in which the patient was too sick to undergo major surgery. Others have pointed out the value of this method calling attention to the facts that it provides wound closure and permits stabilization of altered body chemistry. Diagrams of steps involved in these five operative procedures are outlined in Figures 6, 9, 11, 13, and 15. Photographs of lesions before and after operation are shown in Figures 5, 7, 8, 10, 12, 14, and 16.

RESULTS

Elliptic excision has been used only in the management of very small ulcers. This method was applied in 23 cases with complete

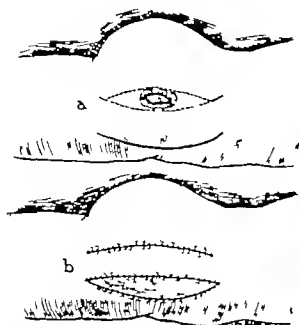


Fig. 13. Diagram of the method of excision of decubitus and closure by a double pedicled flap with free graft at a distance. This method represents a variation of that shown in Figure 9 and it has the same advantages.

healing in 17 or 74 per cent. The value of closure by Z-plasty has been limited. This principle does not often apply to closure following the excision of decubiti as the resultant defect may be quite broad. Z-plasty was used in 4 cases. Three were trochanteric ulcers and 1 was an ulcer over the ischial tuberosity. The operation was successful in 2 cases and in 2 cases failure resulted.

Excision and closure with a pedicled flap and primary closure of the defect caused by rotation of the flap was successful in only 5 (62.5 per cent) out of 8 cases. Healing was effected by this operative technique in 2 cases of sacral ulcer and 3 cases of trochanteric ulcer. The failures occurred following the use of this method in 3 cases of ulcer over the ischial tuberosity. It is felt that the use of a free graft to cover the defect from which the flap was rotated might have effected satisfactory healing in these cases. Considering the size and location of the ulcers the impression has been obtained that excision and closure by a pedicled flap with a free graft at a distance is the best method available. By this method the thick-split graft resides permanently over soft tissue which is not subjected to the pressure of a bony prominence. This method was used in 16 cases with complete healing in 12 (75 per



Fig. 14. a, above, Appearance of decubitus of left trochanteric region in a patient with paraplegia due to a lesion at the level of the eleventh thoracic segment of the cord. b, Appearance 6 weeks after excision of the decubitus and closure by the advancement of a double pedicled flap with free graft over the soft tissues from which the flap was raised as outlined in Figure 13.

cent) and failure in 4 cases (25 per cent). This method was used in the management of 6 sacral ulcers, 9 trochanteric ulcers and 1 tibial ulcer. The use of free skin grafts (thick-split) is reserved for those cases in which the patient was too sick to undergo major surgery. The value of the method lies in the fact that it is a minor operative procedure, a closure may be obtained with resultant stabilization of altered physiology. Though this closure is followed by improvement in the general condition of the patient, it does not provide a closure of sufficient strength to withstand the constant trauma to which the area is subjected in the paralyzed patient. Therefore it is looked upon as a closure of temporary value. It is used in the excising the graft at a later date and covering the formerly ulcerated area with a thick-

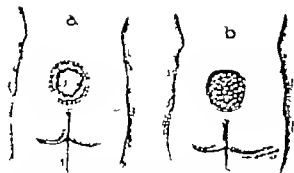


Fig. 5 Diagram of the method of temporary closure of decubitus by the application of multiple small thick split grafts of skin. Free grafts were used only when the general condition of the patient was such that major operative procedure was contraindicated. Upon the degree of irregularity of the granulation tissue of the decubitus rested the decision as to whether the wound was surfaced by single large graft or by multiple small grafts. The method allowed for the early restoration of altered protein metabolism and therefore is useful as a temporary measure. Grafts were successful in 4 out of 5 decubiti to which they were applied. Recognition of the fact that free grafts cannot be expected to withstand daily trauma to bony prominences in paralyzed patients is planned to excise such grafted area at a later date and to cover the defect by pedicled flap, diagrammed in Figure 6.

flap of skin and subcutaneous tissue. The fact that healing followed in only 4 of the 5 cases in which free grafts were used is not considered of statistical significance for the reason that the method was used only in the management of ulcers in those patients with extreme general debility.

Study of Table III shows that ulcers in the sacral area have been healed effectively by operative surgery in 88 per cent of cases. The closure of ulcers in the trochanteric area was successful in 77 per cent of cases. Ulcers in the region of the ischial tuberosity were closed successfully in only 46.6 per cent of cases in the series.

An analysis of the complications which resulted in failure in 16 cases following operative closure is of interest. These complications were as follows: hematoma of wound, 4 cases; undue tension in line of suture, 6 cases; uncontrollable spasm of extremities, 2 cases; massive infection, 2 cases; partial necrosis of flaps, 1 case; lack of co-operation of patient, 1 case.

DISCUSSION

Attention has been called to the fact that complete healing followed in 40 (71 per cent)



Fig. 6 a, above. Decubitus over the sacral area in a patient with paraplegia due to a lesion of the spinal cord at the level of the second thoracic segment. Despite continued supportive therapy with transfusion of plasma and blood supplemented by the giving of amino acids and protein dexters this patient had severe anemia and marked hypoproteinememia. For this reason it was not deemed advisable to subject this patient to major operative procedure. b, Appearance of the sacral area after closure of the decubitus by the application of multiple small thick-split grafts of skin. The general condition of the patient improved rapidly following healing of the wound, and at the time of this report he is a candidate for excision of the grafted area so that the bony prominence may be protected ultimately by a thick pad of soft tissue.

of the 56 decubiti treated by excision and plastic surgical closure. Only those ulcers which had failed to heal after conservative management for a minimum of 10 months were subjected to surgery. It has been observed repeatedly that decubiti of long duration are associated with pallor of the granulation tissue, excessive scar in the floor and at the margins of the ulcers, and with thinning of the skin and subcutaneous tissue adjacent to the ulcers. In the report of Croce, Schul-

TABLE II — RESULTS FOLLOWING EXCISION AND PLASTIC CLOSURE

Type of closure	No. cases	Complete healing	Failures
Elliptic excision and closure	3	7	6
Excision and closure by Z-plasty	4		
Excision and closure by pedicled flap	8	3	3
Excision and closure by pedicled flap with free graft at distance	6		4
Closure by free skin graft (thick-split)	5	4	
Totals	26 (100%)	40 (71.7%)	6 (20%)

TABLE III — RESULTS FOLLOWING EXCISION AND PLASTIC CLOSURE

Location of decubitus	No. cases	Complete healing	Failures
Sacral	7	5	
Trochanteric		6	6
Ileal	3	7	3
Anterior superior iliac			
Tibial			
Totals	10 (100%)	40 (71.7%)	6 (20%)

linger and Shearer the interval of time between onset of the ulcer and the date of surgical excision in 7 patients averaged 80 days. Barker, Elkins, and Poer reported complete healing following surgery in 39 (76.4 per cent) of 51 cases. The interval of time between the onset of the ulcer and date of operation is not given. Because their patients were treated in Army hospitals during the war it is presumed that the majority of the decubiti were of short duration. White and Hamm (14) reported complete healing following surgery in 6 (42.8 per cent) of 14 cases, partial healing in 6 (42.8 per cent) and failure in 2 cases (14.2 per cent). Gibbon and Freeman reported primary healing following surgery in 44 (67.7 per cent) of 65 cases, delayed healing in 10 cases (15.3 per cent), improvement in 5 cases (8 per cent), failure in 5 cases (8 per cent), and death in 1 case (1.5 per cent). In view of the fact that in the cases reported herein the ulcers were of long duration and had exhibited no tendency to heal under conservative measures, the success of surgery in 71 per cent of cases attests to

the soundness of surgical attack upon chronic decubiti in patients who are suffering with paraplegia.

SUMMARY AND CONCLUSIONS

Report is made of experience with the excision and plastic surgical closure of 56 decubiti in paraplegic patients in a veteran's hospital. The locations of decubitus ulcers studied, their etiology, pathology and bacteriology are discussed.

Five methods of operation have been used: elliptic excision and closure, excision and closure by Z-plasty, excision and closure by pedicled flap, excision and closure by pedicled flap with free graft at distance, closure by free thick-split graft of skin. Forty, or 71 per cent of the 56 cases were healed by these procedures.

All of the ulcers in this series were of long duration. They had been present for an average of 12 months in 40 cases in which plastic surgical closure was successful. The ulcers had averaged 15 months in duration in 16 cases (29 per cent) in which plastic surgical closure was not successful. In the management of this group of patients emphasis has been placed upon the application of the established principles of plastic surgery to the closure of the decubiti. Experience has indicated that methods in which the scar of suture resides directly over the site of the former decubitus are apt to be unsuccessful. Elliptic excision was used only in the management of small ulcers. Free graft of skin was used only in the care of ulcers in patients whose general condition would not permit major operative procedure. Evidence in this report indicates that large ulcers are closed successfully in the highest percentage of cases when a flap of skin and subcutaneous tissue is rotated from an adjacent area and the defect at the site of procurement of the flap is surfaced by a free graft of skin.

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SARCOMAS OF THE SMALL AND LARGE INTESTINE

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THE basis of this paper is a study of 15 cases of sarcoma of the small and large intestine this includes 9 cases of sarcoma of the small intestine 5 of the colon and 1 of the rectum. It comprises all the cases collected from the records of the Jewish Hospital in the past 25 years. During the same period there were admitted to the hospital 48 patients with carcinoma of the small intestine 1 377 with carcinoma of the colon and 577 with carcinoma of the rectum. According to these figures the relative proportion of sarcoma to carcinoma of the small intestine is approximately 1 to 55 of the colon 1 to 275 and of the rectum 1 to 577. It appears that even in the case of the small intestine the relative incidence of carcinoma is considerably greater than that of sarcoma although it is generally believed that sarcoma of the small intestine is of more frequent occurrence than is carcinoma. The number of cases of sarcoma presented in this series may be too small to draw any definite conclusions as to the incidence of this lesion in the bowel but it is nevertheless quite significant. Many of the observations recorded here are largely confirmatory of the information already available in the voluminous literature on this subject (3). However additional emphasis will be placed upon those aspects which appear to warrant it.

There are no definite pathognomonic signs symptoms or laboratory criteria on which a diagnosis of sarcoma of the bowel can be made before operation. The onset of the disease, although usually insidious may be acute, and the symptoms may vary in duration from several days to several years. These patients present various forms and locations of their tumors. A study of the cases reveals that the lesion may occur in all age groups although it is most frequent in middle or past middle life. The youngest patient in our series was a 16

year old girl and the oldest a 72 year old male, the average age incidence being 54 years. More than 65 per cent of the patients fell in the age group of 50 to 70 years. These figures are in close agreement with other figures reported in the literature.

It is generally conceded that sarcoma of the intestine occurs more frequently in males (1). In the cases reviewed here there was no appreciable difference in the distribution of the disease in the two sexes. There were 8 males and 7 females showing a slight preponderance among males.

It has been the observation of many investigators that the incidence of the ratio of sarcoma of the small intestine to sarcoma of the large intestine is approximately 2:1 (2). In the series reported here there were 9 instances of sarcoma of the small intestine 2 of the appendix, and 3 of the large bowel a proportion of approximately 2 to 1 in favor of the small intestine.

The etiology of sarcoma of the bowel is still unknown although it is believed by some that trauma may play a part in its development. So far as the cases reported here are concerned no history of injury was recorded in any of the patients.

A study of the cases reported in this series has emphasized in our minds the difficulties one encounters in being certain that a given tumor is sarcomatous or carcinomatous. The onset of the disease was usually insidious in character and clinical evidence of its existence did not appear until late. When the onset was acute and the symptoms of short duration there was always present some complicating factor to account for its acuity. Thus in one patient with lymphosarcoma of the appendix, and in another with a neurofibrosarcoma of the rectum the disease was heralded by a profuse intestinal hemorrhage associated with dizziness fainting and profound weakness. Two other patients with lymphosarcoma of the ileum developed acute intussusception and

only then they first became aware of the existing disease. The majority of the patients however pursued a more chronic course which lasted from several weeks to 2 years.

Blood in the stools appearing as gross hemorrhage or melena was a significant finding in 8 patients in 2 others it was not reported. Patients with bleeding usually complained of weakness and dizziness, and on physical examination showed a variable degree of pallor which was proportionate to the loss of blood. The hemoglobin content of the blood was low and in one instance reached a level of 37 per cent requiring several blood transfusions. The nutrition was fairly well maintained in most of the patients, although some complained of a moderate loss of weight.

Pain frequently described as cramp-like in character was significant in 11 of the 15 patients recorded. The distribution of the pain varied although it was usually confined to the area involved by the tumor. Anorexia nausea and vomiting were infrequent complaints. Constipation diarrhea or both were more common. Many of the patients with constipation resorted to cathartics, and this may account for the occurrence of diarrhea in some of the patients.

A palpable mass was noted in 9 of the 15 patients. The location of the mass varied and was not always constant. In 4 instances it was felt in the right lower quadrant of the abdomen in one, around the umbilicus, right upper and left lower quadrants, respectively. In one instance the mass was palpated in the anterior wall of the rectum and in another it was visualized as a cauliflower bleeding growth in the sigmoid on sigmoidoscopic examination. In many cases the mass was tender to palpation and was fixed in position or freely movable.

Röntgenography was of considerable aid in the diagnosis of these tumors. The roentgenologic appearance of the lesion showed great variations in different cases. In some it presented a mere filling defect or a moth eaten irregularity in the bowel wall. In others the affected bowel appeared as a rigid tube or showed abnormal retention of barium.

In none of the cases reported here was a correct clinical diagnosis made before opera-

tion. Among the various diagnoses made preoperatively were colitis, carcinoma, ovarian cyst, bleeding duodenal ulcer and subacute appendicitis. It is significant that the tumor simulates a number of closely allied diseases of the intestine and renders correct diagnosis most difficult.

In this study the following types of intestinal sarcoma were encountered: lymphosarcoma, 4; leiomyosarcoma, 7; reticulum cell sarcoma, 3; neurofibrosarcoma, 1; a total of 15. The tumors were found in the following locations: jejunum, 2; ileum, 7; appendix, 1; colon, 2; sigmoid, 1; and rectum, 1.

It is the consensus that lymphosarcoma is more frequent of occurrence than are the other forms of sarcoma of the intestine, this holds particularly true in the case of the small intestine. It did not hold true however in the present series. While the lymphosarcoma and reticulum cell sarcoma were particularly common in the small intestine the leiomyosarcomas on the other hand were equally common in the small and large intestine. No cases of lymphosarcoma were noted in the large bowel excepting in the appendix. Since lymphoid tissue forms an important part of the appendix one should expect to find an appendiceal form of lymphosarcoma.

Leiomyosarcoma originates in the smooth muscle cells of the musculature. It is usually slow growing and often well demarcated from the other layers of the intestinal wall. In the present series, there were 7 cases of leiomyosarcoma, 2 occurred in the ileum, 1 in the jejunum, 1 in the appendix, 1 in the cecum, 1 in the transverse colon and 1 in the sigmoid. In 3 of the cases the lesion presented itself as a pedunculated polypoid growth arising by a narrow or broad base from the inner surface of the bowel and partly encroaching upon its lumen. The free surface of the tumor was at times smooth and at others necrotic and ulcerated. In the remaining cases, the neoplasm consisted of a homogeneous mass, grey or pink in color and arising from the muscular coat of the bowel. The mucosa overlying the tumor was sometimes well preserved and apparently unaffected by the growth. On occasions however the mucosa was infiltrated with tumor tissue became ulcerated and



Fig. 1. Photomicrograph of leiomyosarcoma. Hematoxylin and eosin stain $\times 80$.

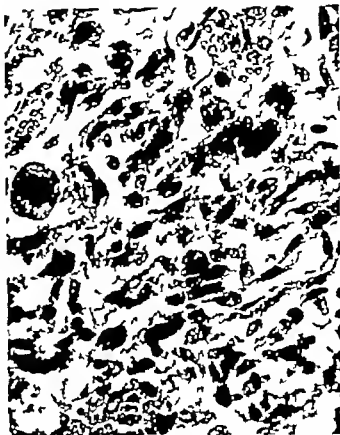


Fig. 2. Higher magnification of Figure 1. Note tumor giant cells. Hematoxylin and eosin stain $\times 215$.

showed scattered hemorrhages. The tumor was usually firm in consistency; in the more rapidly growing forms it tended to become soft and necrotic. The direction of growth was not always uniform. In 2 cases it protruded into the lumen and in the remaining ones it grew outwardly forming a bulge on the exterior of the bowel.

Histologically these tumors can be traced to the muscular coat of the intestine from which they are known to arise. Both in architectural arrangement and in cytologic detail they almost regularly have features in common with the muscular layer and consequently they may readily be recognized as having arisen from this structure. In the case of the tumors presented in this paper the parenchyma was made up of specific tumor cells which approached very closely the mother tissue. The cells formed interlacing bands or whorls running in different directions. They were spindle shaped or polygonal in outline, varying in size and shape and containing a round or vesicular nucleus. The nuclei were hyperchromatic and

showed occasional mitoses. Scattered in the parenchyma were also found multinucleated giant cells. The stroma was very scant and consisted of a small amount of poorly vascularized loose connective tissue (Figs. 1 and 2).

Although the tumor mimics very closely smooth muscle tissue it may on occasions digress widely from the normal and assume a picture closely resembling spindle cell or fibrosarcoma. Some of the cases reported here were first diagnosed as fibrosarcoma, but after more thorough studies, a change in diagnosis to leiomyosarcoma was made. Although cases of fibrosarcoma of the intestine have been reported in the literature we are nevertheless inclined to believe that they are very rare.

Lymphosarcoma. Generally speaking these tumors are fairly rapidly growing with a tendency to grow expansively and metastasize early. Their rapid growth is associated with degeneration, necrosis, hemorrhage and perforation. There were 4 cases of lymphosarcoma in this series, 3 arising in the small in

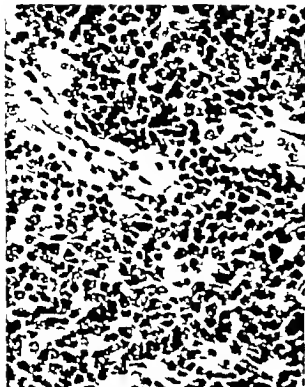


Fig. 3. Photomicrograph of lymphosarcoma. Hematoxylin and eosin stain, $\times 80$.

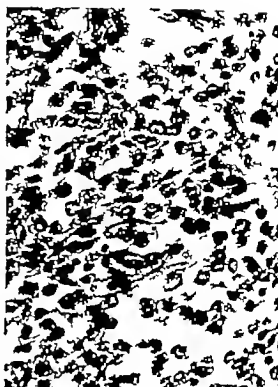


Fig. 4. Photomicrograph of reticulum cell sarcoma. Hematoxylin and eosin stain, $\times 80$.

testine and 1 in the appendix. The growth was either lobulated or nodular, often soft and friable with tendency to ulcerate and hemorrhage. On section the tumor appeared homogeneous, grey pink or yellow in color. In 3 instances the tumor protruded into the lumen of the bowel and was the cause of acute intussusception. The bulk of the growth was usually confined to the mucosa or submucosa, although it may infiltrate the muscular and serous coats.

The close similarity in both architectural pattern and cell morphology of the tumor cells to the lymphoid structure of the intestine is striking and at once suggests a genetic relation. Microscopically the tumor parenchyma was made up of cells which bore a striking resemblance to the small lymphocyte commonly seen in the lymph follicles of the intestine. The cells were small and round, of about the same size and shape as a lymphocyte. The nucleus was also round, hyperchromatic and occupied the major portion of the cell substance, while the cytoplasm was scant and

formed but a narrow rim surrounding the periphery of the nucleus. Mitotic figures were frequently encountered and designated a high degree of malignancy. The structural arrangement of the cells varied somewhat in different tumors. In places the cells were found crowded together into dense nests with very little intercellular connective tissue stroma to support them; in others they assumed a more follicular arrangement. The mucosa overlying the tumor was usually intact and well preserved. There was a tendency, however, for the tumor to invade the muscular coat and occasionally also the serosa (Fig. 3).

Reticulum cell sarcoma. A review of the literature reveals a wide discussion of the genesis of reticulum cell sarcoma. Some investigators classify it as a form of lymphosarcoma, while others consider it to be a type of fibrous connective tissue growth. From the present study it appears to be more closely allied to the lymphosarcomatous group than the fibrous connective tissue forms of neoplasm. The parenchymal cells resemble more closely

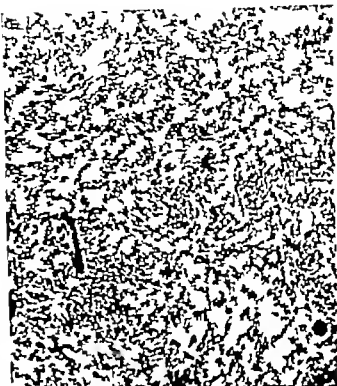


Fig. 5. Photomicrograph of neurofibrosarcoma. Note palisading of cells and rosette formation. Hematoxylin and eosin stain, $\times 80$.



Fig. 6. Higher magnification of Figure 5. Hematoxylin and eosin stain, $\times 215$.

the lymphocyte described in the lymphosarcoma, while the stroma is somewhat more abundant and forms a fine fibrillar or reticular structure.

There were 3 cases of reticulum cell sarcoma, all arising from the small intestine. The structural pattern and cell morphology of the tumors were fairly uniform in all cases. Grossly the tumors were partly firm and partly soft and friable, arising as a rule in the submucosa and spreading out in all directions. On section the surface was a homogeneous gray or pink tissue. In one instance the lesion appeared as an ulcerated cauliflower growth with elevated edges. When this was cut across, a milky fluid escaped from the cut surface. In another case the tumor invaded the wall of the bowel and caused a tubular narrowing of the lumen for a distance of several inches.

Microscopically the tumor parenchyma consisted of polygonal cells varying considerably in size and shape and arranged in groups or nests. The nuclei were irregular in outline and stained deeply. Mitotic figures were fre-

quently encountered designating a high degree of malignancy. The stroma was moderate in amount and showed a fibrillar or reticular arrangement. The primary site of the tumor was in the submucosa from which it spread out in an irregular fashion toward the muscularis. The mucosa as a rule was uninvolved and left intact; in one case it was ulcerated. The lymphatic spaces within the wall of the affected bowel were dilated and filled with tumor tissue. The adjoining lymph nodes and fat were also infiltrated with the tumor (Fig. 4).

Neurofibrosarcoma. This type of tumor is very uncommon in the intestinal tract. It occurred in one instance in this series. Its origin can be traced to the tiny nerve fibers in the muscular coat. In the present series the tumor was located in the rectum and consisted of a nodular mass, partly firm and partly soft. On section it presented a granular yellow gray surface with multiple small hemorrhages.

Microscopically the tumor was made up of spindle shaped cells of various size. The ar-

arrangement of the cells was rather unique in character. In places they formed interlacing bands or pseudorosettes, while in others they assumed a palisade arrangement. Mitotic figures were rather few in number indicating a low grade malignancy (Figs. 5 and 6)

ANALYSIS OF STUDY

The clinical picture presented by this group of cases of sarcoma of the intestine merits some detailed description though in many respects the tumors followed the pattern previously described by many authors. The diagnosis of these tumors is often beset with many difficulties. The early symptoms and signs are by themselves not distinctive and are similar to those associated with other forms of intestinal malignancy. In certain cases the difficulties in arriving at a diagnosis may appear insurmountable. The laboratory tests although of great value are found to be by no means infallible.

Practically all the patients presented past histories which may have had bearing on their illness. Analysis of the diagnostic facts relating to these tumors shows that pain is the most constant subjective symptom and is usually described as cramp like in character. It occurred in more than 70 per cent of the present series. Loss of weight was not a frequent complaint and most of the patients appeared well nourished when first examined. Constipation alternating at times with diarrhea was a more frequent complaint.

The disease often pursued a chronic course. The earliest treated patients dated the onset of their illness to 4 to 7 days prior to hospitalization the latest 2 years giving the average duration of symptoms of 6 months. When complications set in the onset of symptoms was acute and of short duration. Intestinal obstruction perforation and massive hemorrhage are described as the more common forms of complication of the disease.

Physical examination revealed certain significant findings. The majority of the patients showed a secondary anemia which was proportionate in degree to the loss of blood. An abdominal mass was felt in 60 per cent of the patients the mass was either fixed or freely movable and often tender to palpation.

Among the various forms of nonepithelial malignant tumors of the intestinal tract, the following are most commonly encountered: lymphosarcoma, leiomyosarcoma, reticulum cell sarcoma, fibrosarcoma, spindle cell sarcoma, endothelial sarcoma, and Hodgkin's disease. In the present series four varieties of sarcoma were found and described namely lymphosarcoma, leiomyosarcoma, reticulum cell sarcoma, and neurofibrosarcoma. Of these various forms, lymphosarcoma is most common although in the present series the leiomyosarcoma outnumbered the lymphosarcoma in the ratio of approximately 2 to 1.

Sarcoma of the intestinal tract is as a rule a primary lesion and for a long time confines its growth to the bowel. As the disease progresses, the growth extends to involve the entire thickness and circumference of the intestine and even projects into the lumen or forms a bulge on its exterior but its tendency is to localize in the bowel and not metastasize. In some instances however it tends to extend into adjoining structures, especially into regional lymph nodes. This is particularly true in the cases of the lymphosarcoma and reticulum cell sarcoma. When the mucosa is also involved in the tumor process, ulceration usually follows. These changes are responsible at times for a host of symptoms. Under such circumstances bleeding may take place from the ulcerated intestinal wall and blood may appear in the stools. Thus 8 of the patients in this series showed tarry stools which reacted positively to benzidine, and 2 showed gross hemorrhages. Metastasis in the case of the lymphosarcoma and reticulum cell sarcoma takes place by the usual route through the lymph channels. In the case of the other forms of sarcoma, the spread is usually through the venous route.

In view of the present study of these cases and in correlation of the data with the various theories offered on the histogenesis of sarcoma of the intestine, we are inclined to consider these tumors as neoplasms arising from specific constituents of the intestinal wall. Throughout the entire series of cases, the histologic picture presented by the tumors bore a striking morphologic resemblance to the tissue from which they arose. Thus, the leiomyosar-

coma closely resembled the smooth musculature of the intestine, and the lymphosarcoma resembled the lymphoid tissue normally present in the intestinal mucosa. The reticulum cell sarcoma bore a morphologic resemblance to the large, pale staining cells forming the reticulum of the lymph follicles and there is no doubt as to the origin of this tumor from that structure. It is held by some that this tumor is of fibroblastic origin and by others, that it is of lymphoid origin. From the present study of the morphology of this tumor we are more inclined to believe that it arises from lymphoid tissue. Its structural pattern site of origin way of growth and its spread through the lymph stream rather than the venous channels is most suggestive of lymphoid origin. The neurofibrosarcoma consists of a mixture of nerve fibers and connective tissue and there is no doubt therefore, as to the origin of this tumor from the nerve elements of the intestinal wall.

Diagnosis is invariably late, as it is dependent on the onset of symptoms and it is well recognized that unfortunately the early symptoms of the sarcoma of the intestine are vague and apt to be confused with those of other lesions in the intestine. There is of necessity a latent period between the earliest tumor formation and the patient's awareness of something amiss and the duration of this period cannot be established at present. Owing to the low grade of malignancy of some of these growths, by the time the disease has produced symptoms of hemorrhage obstruction or perforation it is nearing the terminal stage. In the present series an accurate diagnosis of sarcoma was not made in any of the patients preoperatively and in many instances a correct interpretation of the lesion was not made until a histologic examination of the specimen

was done. In reviewing the cases presented we note several clinical facts. First in some of the cases of acute involvement the process was ushered in by the classic syndrome of sudden hemorrhage or sudden intestinal obstruction. In most of the cases the findings were corroborated at operation. Second the largest group of cases existed in which there was no definite clinical evidence suggestive of the presence of a neoplasm. Roentgen studies of these neoplasms are often helpful in locating the site of origin of these tumors and rendering diagnosis more accurate.

Little need be said of the prognosis in cases of intestinal sarcoma. If the condition is discovered early long before metastasis has had a chance to occur and complete resection of the lesion is done a more favorable prognosis may be rendered. This holds particularly true in the more slowly growing tumors such as the leiomyosarcoma and neurofibrosarcoma which grow slowly and metastasize late in the disease. The ideal treatment is complete removal if possible. When the lesion is discovered late permitting metastasis to occur, the prognosis as in other malignant tumors is rather poor.

CONCLUSIONS

Fifteen cases of sarcoma of the small and large intestine are reviewed. In 7 of these the lesion was a leiomyosarcoma in 4, lymphosarcoma in 3, reticulum cell sarcoma, and in 1, neurofibrosarcoma.

The diagnosis of sarcoma of the intestinal tract is difficult as it simulates other lesions of the intestine.

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THE TREATMENT OF SEVERE INTRACRANIAL INFECTION BY REPEATED INTRAVENTRICULAR INJECTION OF PENICILLIN

Theoretical and Practical Considerations

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UNDER the impetus provided by the recent war penicillin has eclipsed the sulfonamides in the results achieved in the treatment of intracranial infections and has provided the physician with a powerful addition to his clinical armamentarium. Combination of both penicillin and sulfonamides has achieved even greater miracles in central nervous system infections. Nevertheless, although the mortality of intracranial infection has thus been greatly reduced in the face of a purely medical attack, there yet remains a group of cases in which the mortality and morbidity is high.

It is in these cases that a combined attack by both physician and surgeon utilizing all the general and special therapeutic methods at their command in an endeavor to bring the antibacterial agents into the closest possible relationship with the infecting organisms for as long as possible can materially improve the outlook. Especially is this so in cases of purulent meningitis and ventriculitis, cerebral abscess, posttraumatic intracranial infections and those intracranial lesions secondary to ear, nose, and throat infections.

A series of these cases, the first of which has been reported elsewhere (Wyke and Vanderfield 1946) is being studied by the writer. The present paper deals with the theoretical and practical considerations upon which the intraventricular method of treatment is based together with certain general suggestions regarding the management of severe intracranial infections. Detailed discussion of other cases in the series, and results of special investigations relating to certain problems arising from the present paper will be reported later.

Up to the present, no systematic account of the theory and practice of the intraventricular method of administering penicillin has appeared in the literature, although the procedure has been employed sporadically in various centers on numerous occasions.

Before turning to a consideration of the practical technical procedures involved in the method of treatment certain theoretical considerations upon which its clinical application depends, will be discussed in detail.

FACTORS GOVERNING THE PASSAGE OF PENICILLIN FROM THE BLOOD STREAM INTO THE CEREBROSPINAL FLUID CIRCULATION

It is apparent that penicillin can traverse the blood brain barrier slowly in two directions under normal conditions, passing either from the blood stream into the cerebrospinal fluid or vice versa. The evidence for this will be discussed. However the quantitative aspects of this phenomenon constitute the significant feature, supplying the answer to the problem as to whether an adequate bacteriostatic concentration of the drug can be built up and maintained in the cerebrospinal fluid from doses administered systemically. The

temporal relations of the $\frac{\text{serum}}{\text{C.S.F.}}$ penicillin ratio will form the subject of a later communication but sufficient work has been done to date to suggest certain conclusions.

Early in the therapeutic history of the drug, it was claimed (Abraham and associates, 1941) that intravenous injection of penicillin into cats did not lead to the excretion of significant amounts of the drug into the cerebrospinal fluid. Later Rammelkamp and Keefer (1943) were unable to demonstrate any penicillin in the cerebrospinal fluid of man following single

intravenous doses of 10 000 to 20,000 Oxford units. The same result was reported in a case receiving penicillin by the continuous intravenous drip method at the rate of ~ 500 to 3,000 units per hour even after 24 hours of such therapy. In addition Fleming (1943) comparing blood and cerebrospinal fluid concentrations of penicillin during intramuscular administration concluded that excretion of the drug into the cerebrospinal fluid was negligible. Similar observations were reported by Keefe and associates (1943) Struble and Bellows (1944) and Dolphin (1944).

Officer Loewenthal and Perry (1944) stated that their experience was the same, with both intramuscular and intravenous injections of the drug. They cited one case in particular in which no penicillin was detectable in the cerebrospinal fluid although the patient received 200 000 units of penicillin intravenously. Herrell, Nichols and Heilman (1944) were also unable to demonstrate penicillin in the cerebrospinal fluid of 4 patients with meningitis receiving 100 000 units per day by continuous intravenous infusion.

Notwithstanding these reports to the contrary, Rosenberg and Sylvester (1944) claimed that penicillin was excreted into the cerebrospinal fluid in bacteriostatically adequate amounts. They reported 8 cases of meningitis in which patients were treated with intramuscular or intravenous penicillin in doses of 20 000 to 40 000 Oxford units every 3 hours whose cerebrospinal fluid contained the drug in concentrations of 0.03 to 0.35 unit per cubic centimeter within 60 to 140 minutes.

However these authors noted as have others (e.g. Rammekamp and Keefe 1943, Smith, Duthie and Cairns 1946) that both absorption and excretion of the drug from and into the cerebrospinal fluid are very variable processes in different individuals especially in the presence of meningitic inflammation. The difference in the absorption rate in patients with normal and inflamed meninges is well seen in Figure 1 based on results obtained in the writer's series of cases in which it is apparent that absorption from the subarachnoid space is about twice as rapid in cases with meningitis as in those without. Similar results have been obtained by Cairns and his colleagues.

That the processes of excretion from the blood into the cerebrospinal fluid are also accelerated in meningeal infections is apparent from the work of Walker and Johnson (1945). These workers demonstrated that whereas under normal conditions in the meninges little penicillin enters the cerebrospinal fluid from the blood when the meninges are irritated by bacterial chemical or physical agents excretion is much increased. In normal monkeys with blood penicillin levels of 23.5 to 32.5 units per cubic centimeter no penicillin could be detected in the cerebrospinal fluid. But after inducing a meningeal reaction by coagulase of the animal or by intrathecal injection of air or bacteria 0.17 to 0.78 units per cubic centimeter were demonstrated in the spinal fluid. They noted that in man systemic (intramuscular) injection of penicillin 6 to 8 hours after performance of pneumoencephalography resulted in detectable amounts of penicillin being present in the cerebrospinal fluid within an hour.

Further weight is led to Walker and Johnson's hypothesis by recent work of Lange, Schwimmer and Boyd (1946). These authors demonstrated a three to fourfold increase in permeability of the capillaries in the meninges and choroid plexuses of patients with meningitis. They gave each of their cases an intravenous injection of 5 cubic centimeters of a 5 per cent solution of fluorescein and estimated the fluorescein content of the cerebrospinal fluid and blood 1 hour later. Using this method it was found that in normal people the fluorescein content of the cerebrospinal fluid does not exceed 300 γ per 1000 cubic centimeters whereas in the presence of meningitis there is an increase of up to 1000 γ per 1000 cubic centimeters. They also noted that waning of the meningeal inflammation was accompanied by a diminution in the fluorescein excretion and a rise in the $\frac{\text{plasma}}{\text{CSF}}$ fluorescein ratio.

Similar conclusions regarding the increased permeability of inflamed meninges are reported by Kinsman and d'Alonzo (1946). These results lend weight to the claim of Rosenberg and Sylvester that penicillin may be excreted into the cerebrospinal fluid in cases of meningitis but for clinical purposes it

As soon as the influence of the drug is removed multiplication may recommence, if the organisms have not been destroyed by the intrinsic antibacterial agents of the body (leucocytes and antibodies) or by penicillin present locally in bactericidal concentration. Penicillin must be kept continually in contact with all infected tissues (e.g. meninges and choroid plexuses) in adequate concentration until the natural body defenses have had time to deal with the infection (Florey and Jennings, 1945) and this cannot be achieved unless the drug is introduced directly into the cerebrospinal fluid.

For such reasons it is essential that adequate concentrations of penicillin should be maintained locally (i.e. in the cerebrospinal fluid especially within the ventricles) for sufficient time, in order to achieve complete destruction of the infecting organisms. This is particularly important in view of the fact that some organisms may become penicillin resistant although remaining pathogenic, when exposed to sublethal doses of the drug (Abraham and associates 1941; Rammelkamp and Maxon 1942; McKee and Houck 1943; Officer, Loewenthal, and Perry 1944; North and Christie, 1946). It is therefore important to determine the critical lethal concentration of penicillin for each of the organisms infecting the central nervous system. The relevant figures in this regard are given by Rammelkamp and Keefler (1943) and Walker and Johnson (1945).

It should be pointed out however that their results represent minimal concentrations determined *in vitro*. Other modifying factors are present under clinical conditions which tend to make the effective penicillin levels a little higher. These factors are considered elsewhere in the present paper.

It cannot be denied that clinical cure of meningitis has sometimes resulted in patients receiving penicillin by the systemic route alone (e.g. Price and Hodges 1944; Dawson and Hobby 1944; Tee, 1945; Milroy and Hughes 1945). However such cases provide no index of the efficacy of penicillin excretion into the cerebrospinal fluid as other factors are involved. Most of these patients receive or have received sulfonamide drugs as well as

penicillin at some stage of their treatment and these drugs (especially sulfadiazine) are capable of sterilizing the cerebrospinal fluid in infections with susceptible organisms. In addition many cases of intracranial infection especially those of meningococcal or pneumococcal origin have a concomitant bacteremia of intermittent type. Possibly the action of penicillin upon the systemic component of the infection may be partly responsible for the clinical improvement.

During the last 12 months further studies have appeared dealing with the passage of penicillin from the blood stream into the subarachnoid space and these support the earlier findings.

McDermott and Nelson (1945) have examined the problem with reference to the treatment of neurosyphilis with penicillin. In 70 patients they were unable to demonstrate significant amounts of penicillin in the cerebrospinal fluid by 4 different methods of assay, following parenteral dosage of penicillin in varying amounts. The results were unaffected by the presence or absence of neurosyphilis in the patients. Following intramuscular injections of 300 000 to 500 000 units of penicillin only 0.02 unit per cubic centimeter were demonstrable in the cerebrospinal fluid three to four hours later.

Following the work of Walker and Johnson (1945) cited earlier, Dumoff-Stanley and her colleagues (1946) examined the penicillin excretion into the cerebrospinal fluid in 14 patients, 6 of whom had intracranial infections. During intramuscular or intravenous injection of the drug penicillin was detected in the cerebrospinal fluid of 6 patients, 4 of whom had meningitis. The authors found that in 2 babies penicillin was detectable in the ventricular fluid while absent in that in the subarachnoid space. In another case the drug was present only in the last few cubic centimeters of 120 cubic centimeters of fluid withdrawn during pneumoencephalography. They conclude from these facts that the passage of penicillin from the blood stream into the cerebrospinal fluid occurs primarily through the choroid plexuses, as previously suggested by Cooke and Goldring (1945). They also found a serum concentration of at least 0.625 unit per

cubic centimeter to be the minimal blood level for adequate transchoroidal excretion of penicillin and that no patient with penicillin in his blood stream for less than 12 hours attained therapeutically effective concentrations of the drug in the cerebrospinal fluid. They therefore conclude that systemic administration of penicillin in the usual doses will not consistently yield measurable concentrations of penicillin in the cerebrospinal fluid.

More recently Schwemlein and associates (1946) reported that they were unable to detect significant concentrations of penicillin in the cerebrospinal fluid of patients with syphilis following intramuscular doses of 20,000, 40,000 and 200,000 units. However following massive intravenous administration by the continuous drip method effective levels were attained in cases of early syphilis. Their series consisted of 167 patients with primary or secondary syphilis, each of whom received 10 to 25 million units of penicillin given by continuous drip for 24 hours. Their results reveal that continuous intravenous administration of 10 to 20 million units produces bacteriostatically adequate concentrations in the cerebrospinal fluid. Use of such large doses in this manner is attended by certain reactions which the authors list as thrombophlebitis, nausea vomiting and azotemia; there were no meningeal reactions. Similarly Kaplan and associates (1946) were unable to detect any significant excretion of penicillin into the cerebrospinal fluid following intramuscular administration in neurosyphilis.

A study of the reports which have been discussed leaves the impression that the efficacy with which penicillin traverses the blood brain barrier under normal and abnormal conditions remains to be determined. It appears that the Atlantic Ocean separates two schools of thought in this matter. On the one hand is the English school headed by Florey and Cairns and including the original workers with the drug which denies the therapeutic efficiency of systemically administered penicillin in cases of severe intracranial infection and recommends direct introduction of the drug into the cerebrospinal fluid. On the other is the American school many members of which question the rationale of this method of

therapy (see Reese, 1945) and plead for parenteral administration only. However dissentient voices are heard in both groups.

In view of the unsettled state of the problem it is apparent that definitive studies dealing with the time relations between serum and cerebrospinal fluid levels of penicillin under normal and abnormal intracranial conditions should be undertaken. Such investigations are at present being pursued in Sydney and the results will be reported in a subsequent communication. However in spite of a few reports to the contrary it would appear justifiable, on the present available evidence, to conclude that therapeutically adequate concentrations of penicillin cannot be maintained within the cranial cavity by intermittent or continuous systemic administration of the drug in reasonable doses.

For this reason the writer believes that in all cases of intracranial infection with susceptible organisms except perhaps those of comparatively benign type penicillin should be introduced directly into the cerebrospinal fluid or circulation at repeated intervals, in addition to other therapeutic measures that may be undertaken. In severe cases the indications of which are outlined later such administration is preferable into the lateral ventricles of the brain with or without intraspinal administration as well.

DEVELOPMENT OF THE PROCEDURE OF DIRECT INTRODUCTION OF PENICILLIN INTO THE CEROBROSPINAL FLUID

Penicillin was first introduced directly into the cerebrospinal fluid of human patients in 1942 by Fleming (1943). His patient was a moribund case of streptococcal meningitis and the lumbar route was employed. Florey and Florey (1943) next reported a case of meningitis in which patient was treated with penicillin administered by the cisternal route and in the same year Smith, Duthie and Cairns (1943) and Barker (1943) described cases of pneumococcal meningitis successfully treated by intrathecal injections of penicillin. A further 23 cases of pneumococcal meningitis, some of whom received intrathecal injections of penicillin were reported by Rammelsberg and Keefer (1943). Other cases of meningitis

in which patients were treated in this manner were recorded by Keefe and associates (1943). Following these accounts Dolphin (1944) reported 3 cases of suppurative meningitis treated with intraspinal and intraventricular penicillin. This together with an account by McCune and Evans (1944) constitutes the first reference to use of the intraventricular route for the administration of penicillin in intracranial infection.

Reports of a further 16 cases of meningitis receiving daily intrathecal or intraventricular injections of penicillin were presented by Cairns, Duthie, Lewis and Smith (1944). Their cases were all patients suffering from pneumococcal meningitis; there were 4 deaths in the series. The penicillin was injected into both spine and ventricles in amounts of 4 to 10 cubic centimeters of a solution diluted in isotonic saline so that the concentration was 250 to 500 Oxford units per cubic centimeter. The average single dose into ventricles or spine was 3000 to 4000 units. Following injection of such a dose into the lateral ventricles penicillin was soon demonstrable in the lumbar fluid at a concentration of 0.4 unit per cubic centimeter (ten times that necessary to inhibit the growth of a sensitive pneumococcus) being present after 24 hours.

The fall in concentration and the relation between ventricular and spinal fluid levels of penicillin at successive intervals are seen in Figure 2 based on figures from the writer's series of cases. It is apparent that the intraventricular concentration falls off in an exponential manner; half concentration being attained in about 5 hours. Complete disappearance of the penicillin in the ventricles results in about 24 hours. The level of penicillin in the lumbar fluid does not parallel that in the ventricles but pursues a more rectangular course. It must be pointed out, however, that these values are merely averages, the limits of variation in different patients being relatively wide. However they agree closely with the results of Cairns and his colleagues.

Results similar to those described were noted by Officer Loewenthal and Perry (1944). The lumbar fluid of one of their cases contained 0.4 unit per cubic centimeter 14 hours after injection of 10 000 Oxford units of

penicillin into the right lateral ventricle. Penicillin introduced into the lateral ventricles soon spreads, in the absence of a cerebrospinal fluid block to all parts of the subarachnoid space (Cairns and associates 1944, Cairns 1945), and thence slowly into the blood stream (Rammellkamp and Keefe 1943) whence it is excreted into the urine and bile (Rammellkamp and Bradley 1943) and perhaps, in minute amounts back into the cerebrospinal fluid (see Fig 1).

Further cases of intracranial infection treated with penicillin administered into the spinal theca or cisterna magna were reported by Pilcher and Meacham (1943, 1944), Miller and Ross (1944), Officer Loewenthal, and Perry (1944), Waring and Smith (1944), Meads and associates (1944), Rosenberg and Arling (1944), Turner (1944), Evans (1944), Vickery and Dey (1944), Herrell, Nichols and Hellman (1944), Worth (1945), Baird (1945), Appelbaum and Nelson (1945), Sweet and associates (1945), Hall and associates (1946), and Naffziger and associates (1946). All of these workers recorded clinical results far better than any achieved previously and expressed belief in the efficacy of the direct method of treatment.

Later, Johnson and Walker (1945) successfully treated a patient with postoperative meningitis and ventriculitis due to the Staphylococcus albus by direct injections of penicillin into the ventricles through a rubber catheter fixed *in situ*. Baird (1945) used the ventricular route with success in a case of pneumococcal meningitis. Direct injection of penicillin into the ventricles in cases of meningitis was also recommended by Florey and Jennings (1945). In the same year further cases were described in which the intraventricular route was employed for the administration of penicillin. Cases of primary meningitis, as well as intracranial infections secondary to war wounds of the skull and brain which received this method of treatment were noted by Rewell (1945), Haynes (1945), and Rowe and Turner (1945). During the present year additional reports of the use of the ventricular route in the treatment of infected brain wounds, especially transventricular lesions, have appeared as the result of experiences in the recent war. Further

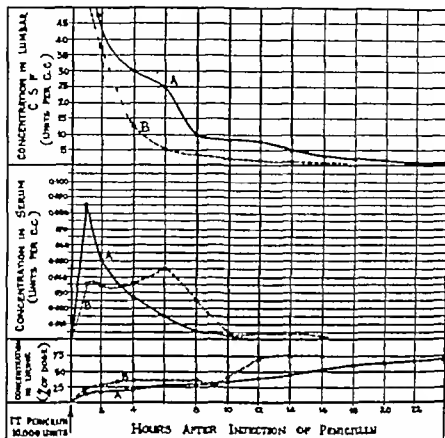


Fig. 1. Quantitative features of the absorption of penicillin from the cerebrospinal fluid following intrathecal injection of 0.000 units in cases without (*A*) and with (*B*) meningitis. The upper graph represents the exponential decrease in concentration in the spinal fluid. The middle graph indicates the concurrent changes in serum concentration, while the lower one indicates the gradual excretion into the urine as the cerebrospinal fluid and serum concentrations fall.

cases of primary meningitis treated in this manner have also been recorded. Examples of these cases and the excellent results obtained are noted in papers by Hudson and associates (1946) Webster, Schneider and Lofstrom (1946) Smith, Duthie, and Cairns (1946) Turner (1946) Liras (1946) Jepson and Whitty (1946) Miller and Delohery (1946) and Wyke and Vanderfield (1946).

COMPLICATIONS OF DIRECT INTRODUCTION OF PENICILLIN INTO THE CEREBROSPINAL FLUID CIRCULATION

Ever since the introduction of penicillin as an addition to the clinical armamentarium in the attack on intracranial infection debate has arisen as to possible toxic effects of the drug upon nervous tissue when in direct contact

with it. For obvious reasons, consideration of this question is important in relation to any attempt at direct introduction of penicillin into the cerebrospinal fluid, especially into that within the cerebral ventricles. The evidence bearing on this problem will therefore be reviewed in detail.

The earlier workers with crude penicillin made no mention of reactions to intrathecal or intracisternal injection of the drug, but cases so treated were sporadic and the doses employed were relatively small. Early in the penicillin era it was suggested that the calcium salt of the drug was more toxic to the tissues than was the sodium salt (Florey and Jennings, 1942) but subsequent experience has not substantiated this (Herrell and Nichols, 1943; Gyöbri and Elmes, 1944; Florey and Jennings,

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1945) The elimination of impurities present in the earlier preparations may be partly responsible for this *volte face* (Berger, 1945 Committee on Medical Research 1946) What ever be the reason, it should be pointed out that in all the cases studied in Sydney by the writer the patients received intrathecal or intraventricular or both injections of the calcium salt of penicillin as prepared by the Commonwealth of Australia Serum Laboratories, and no toxic reactions were manifest.

In 1941 it was shown (Abraham and associates 1941) that intracisternal injection of penicillin in the rabbit produced no histological or functional disturbances. Following this report Florey and Florey (1943) Fleming (1943) Smith Duthie, and Cairns (1943) and Cairns and associates (1944) employed intrathecal or intracisternal injections of up to 4000 Oxford units in man without ill effects. Officer Loewenthal and Perry (1944) demonstrated the absence of toxic reactions to penicillin in the delicate tissues of the chick embryo and administered the drug intrathecally to human patients in repeated doses of 15 000 units, without complications.

As larger doses were employed dissentient reports appeared in the literature, especially in the United States Pilcher and Meacham (1943) and Rammelkamp and Keefer (1944) claimed that intrathecal injection of penicillin produced irritative changes in the meninges. In a brochure published by Merck and Co (1943) headache vomiting pleocytosis and increase in pressure in the cerebrospinal fluid were noted as following intrathecal injection of 10 000 Oxford units of penicillin.

In England Cairns and associates (1944) described systemic reactions following intraventricular injection of 3000 to 4000 units of penicillin. These manifestations consisted of a patchy erythema, sweating, pilomotor activity and vomiting lasting some 10 to 20 minutes after injection. However they pointed out that the preparation used was impure containing at most only 50 per cent of pure penicillin. Subsequently Johnson and Walker (1945) described a case of a 22 month old baby in which intraventricular injection of 50 000 units of penicillin diluted in 5 cubic centimeters of normal saline was followed by

unconsciousness in 1 hour and in 3 hours, by generalized convulsions. These authors believed the effect to be the result of an individual idiosyncrasy to the drug, and mentioned that they had injected up to 100,000 units of penicillin into the ventricles on other occasions without mishap. Idiosyncratic reactions to penicillin given by other routes have been noted (Pyle and Rattner, 1944 Vickers 1946) although they are rare.

Johnson and Walker's explanation may well be correct for the writer has repeatedly injected 50 000 units of undiluted penicillin solution (containing 10,000 units per c.c.) into the lateral ventricles of numbers of patients, including two babies under the age of 1 year, without the production of fits or other reactions. Miller and Delohery (1946) also make no mention of toxic reactions following intraventricular injection of 100,000 units of penicillin at repeated intervals. However Smith, Duthie, and Cairns (1946) mention 4 cases in which signs of lumbar meningeal and cord damage appeared following intrathecal injection of 100 000 units and Walker and Johnson (1945) had previously noted another. Siegal (1945) made a similar claim in the case of a patient receiving daily intrathecal injections of 40 000 units of penicillin but in this instance the sequelae were probably more the result of the disease than of the intraspinal therapy. In monkeys, Walker and Johnson (1945) described perianal paresthesia following intrathecal injection of 20 000 units of penicillin diluted in 1 cubic centimeter of normal saline. The effects were apparent in 10 minutes and lasted up to 1 hour. These authors suggested that lumbar radiculitis and arachnoiditis were possible complications of massive intraspinal therapy with penicillin. They also noted the occurrence of a transient increase in cell count in the spinal fluid following intrathecal injection of penicillin. The same phenomenon (i.e. pleocytosis) has been encountered twice by the writer following intraventricular injection of the drug. This reactive pleocytosis appears to be far less common now than in the earlier days of the penicillin era, perhaps because of increased purity of the available preparations. Moreover, it appears that this reaction may not be due primarily to the penicillin (43)

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sufficient concentration (Buggs and associates 1946 Forgas and associates, 1946 Johnson and associates 1946 Walker and associates 1946) In the case of the latter 3 these disturbances are of such an order as to preclude their local application to the central nervous system Among the antibiotics at present available penicillin and streptomycin appear to have the least active convulsive components in relation to their antibacterial activity With these two agents there is a wide difference between the convulsive threshold and the effective therapeutic level (Johnson et al 1946)

Pathological evidence of irritant effects of penicillin on brain tissue has been obtained by Russell and Beck (1945) These workers found that functional and histological changes (hemorrhage and necrosis) occurred in the brains of rabbits in which concentrated penicillin solution (10 000 units per c.c.) was applied directly to the cerebral cortex Similar changes are also described in the brains of monkeys by Johnson and colleagues (1946)

The result of these investigations especially in the United States, has been to stimulate suspicion of the procedure of direct introduction of penicillin into the cerebrospinal fluid of human patients The culmination of these fears is expressed in an editorial in the recent *Year Book of Neurology* in which Hans Reese (1945) seriously questions the rationale of such methods of treatment and advises against their use

However the conclusion to be drawn from all these reports is not that they contraindicate intraspinal or intraventricular administration of penicillin but that there is a limiting amount of the drug varying with different animal species which may safely be brought into direct relationship with the central nervous tissue This appears to be about 10,000 Oxford units per cubic centimeter in man when applied directly to the motor cortex Provided a local concentration of this degree is not exceeded in the intraventricular fluid the direct introduction of penicillin into the lateral ventricles of the brain is an entirely safe proceeding

As has been previously pointed out the writer has repeatedly injected 50 000 units of penicillin into the lateral ventricles of pa-

tients varying in age from 2 months to 53 years, without untoward effects This dose is administered as 5 cubic centimeters of a solution of the calcium salt of penicillin in a concentration of 10 000 units per cubic centimeter

That such doses are well within the limits of safety in the case of human patients is well borne out by the experiences of many neurosurgeons in the recent war Accounts based on observations of hundreds of cases of post-traumatic intracranial infection from many theaters of war in which penicillin was introduced into the ventricles, subdural space or into brain cavities or applied directly to the cerebral cortex testify to the efficacy and safety of intraventricular injection of penicillin Reports by Florey and Cairns (1944), Cairns (1945), Worth (1945), Haynes (1945), Rowe and Turner (1945), Webster Schneider, and Lofstrom (1946), Turner (1946) Martin and Campbell (1946), Weaver and Frisham (1946), Smith Duthie and Cairns (1946) and Jepson and Whitty (1946) provide ample evidence of the value of the intraventricular method of treatment in cases both of primary and of secondary intracranial infections

CLINICAL INDICATIONS FOR REPEATED INTRODUCTION OF PENICILLIN INTO THE LATERAL VENTRICLES OF THE BRAIN

Officer, Loewenthal and Perry (1944) proposed the following principles to be observed in treating any disease with penicillin (1) the infecting organism must be sensitive to the action of penicillin (2) the active principle must be brought into contact with the organism in sufficient concentration (3) abscesses must be drained, (4) dead tissue must be removed These postulates are valid for intracranial infections, as well as for infections elsewhere With them in mind and in the light of the previous theoretical discussion the following criteria are suggested as guides to the selection of cases suitable for treatment by repeated intraventricular injections of penicillin Presupposed of course, is the availability of personnel and facilities for carrying out the necessary procedures

1 Any case of intracranial infection with a penicillin sensitive organism in which the

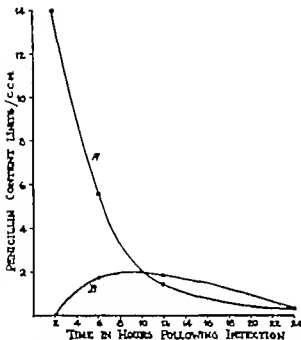


Fig. 2. The relative concentrations of penicillin in the ventricular and spinal cerebrospinal fluid following intraventricular injection of 0.000 units. The ventricular concentration falls off in an exponential manner while that in the lumbar fluid pursues a more rectangular course. A ventricular fluid, B lumbar fluid.

cerebrospinal fluid obtained at the initial lumbar puncture is obviously purulent with a cell count of over 600 polymorphonuclear leucocytes per cubic millimeter and at a pressure greater than 250 millimeters of water.

In all cases, an essential preliminary to the institution of the intraventricular method of treatment is bacteriological identification of the infecting organism. Whenever possible, this should be supplemented by quantitative estimation of its penicillin sensitivity. Even if identification of the organism and determination of its sensitivity has already been performed as a corollary to other methods of therapy the assay should be repeated either at lumbar or ventricular puncture, at the outset of intraventricular penicillin therapy and in some cases, during treatment by this method.

This is especially important in cases in which the intraventricular method of treatment is initiated by failure to respond to medical therapy with sulfonamides or penicillin as the infecting organism may belong to a penicillin insensitive group or have developed resistance to the drug during treatment. In addition, some

strains of organisms usually considered unresponsive to penicillin may be sensitive to its action. An example of this is Pittman's (1931, 1933) S (b) strain of *Hemophilus influenzae*, which has recently been shown to be sensitive to the action of penicillin (27) to about the same degree as a standard staphylococcus. Forgas and his colleagues have successfully treated with penicillin a patient with influenza meningitis due to this organism.

2 Cases of intracranial infection with an organism of high virulence or with organisms which are only sensitive to relatively high concentrations of penicillin.

The previous discussion has shown that high concentrations of penicillin cannot be attained or maintained in the cerebrospinal fluid within the cranium by systemic administration of the drug. Therefore, in order to maintain high local concentrations of penicillin in both ventricles and subarachnoid space, it should be introduced directly into the cerebrospinal fluid circulation by intraspinal and intraventricular injection. This is especially important in babies and young children and may be performed with ease by fontanel puncture if the bregma has not completely closed. Any case of pneumococcal meningitis in infants is a special indication for the early use of the intraventricular route and it should be employed more often in such cases in view of the relative frequency and high mortality of this disease for in 642 cases of meningitis in children, Lindsay Rice and Selinger (1940) found 11.4 per cent to be due to pneumococcus. Institution of repeated intraventricular injections of penicillin may be a life-saving measure in these cases. An example of this is provided by two babies suffering from pneumococcal meningitis recently seen by the writer who were considered to be moribund, and in whom systemic and intraspinal therapy had failed to produce any response. Following 6 daily intraventricular injections each of 30,000 units of penicillin, both patients recovered completely.

3 Cases of intracranial infection with a susceptible organism which fail to show early and progressive improvement under medical treatment.

Any case of intracranial infection in which there is not a satisfactory response to systemic

administration of penicillin, or the sulfonamides or both with or without intraspinal penicillin therapy should receive intraventricular injections of the drug if the causative organism is penicillin sensitive. Especially does this apply to any comatose patient with intracranial infection who does not recover consciousness within 12 hours of instituting medical treatment or any case in which papilledema develops during medical treatment.

4 Cases of intracranial infection with a penicillin sensitive organism where a cerebrospinal fluid block is expected or suspected

Cerebrospinal fluid block may occur anywhere in the ventricular or subarachnoid space in cases of intracranial infection. The common sites are in the posterior cranial fossa in the sylvian aqueduct within the foramen of Monro in relation to the tentorium cerebelli or in the lumbar theca. It has been suggested that herniation of the cerebellar tonsils through the foramen magnum as a result of the high intracranial pressure is a common cause of block in cases of meningitis (Shalom 1945). However this has not been a common feature in the writer's cases. More frequent causes of block are the formation of fibrous adhesions which obstruct the free flow of cerebrospinal fluid or compression and displacement of the ventricular system by the development of an intracranial abscess. But in the presence of an intracranial abscess tonsillar or calcarine herniation may become a potent cause of block especially if frequent lumbar punctures are performed.

The frequency with which cerebrospinal fluid block occurs as a result of adhesion formation depends upon a number of factors the most important of which will be discussed further.

a The nature of the infecting organism The development of cerebrospinal fluid block and consequent hydrocephalus appears to be most frequent in pneumococcal infections of the nervous system. It is less frequent with *Staphylococcus aureus* infections, and still less in those due to meningococci and streptococci. The formation of basal adhesions is a complication of considerable significance in pneumococcal meningitis as it may lead to death of

the patient, even though the cerebrospinal fluid has been completely sterilized. For this reason the use of agents to prevent formation of the fibrous adhesions which later become organized into dense fibrous bands is under consideration. Heparin has been suggested as a possible solution to this problem (Signorelli and Friedman, 1945; Turner 1946) and the writer is at present investigating the possibility of introducing heparin or a fibrinolytic prepared from blood, into the ventricles along with the penicillin in an endeavor to prevent the formation of the primary adhesions which are the result of deposition of fibrin. Later these become organized (if the patient survives the infection) by fibroblastic permeation from the blood vessels and then constitute dense secondary adhesions which are intimately blended with the thickened arachnoid. If formation of the primary adhesions can be prevented the incidence of post-infective hydrocephalus, with its entailed mortality and morbidity will be reduced to a great extent.

These complications are becoming increasingly frequent as more and more patients survive intracranial infections which in other days were fatal. The use of sulfonamide drugs and penicillin inhibits bacterial activity but does not check the fibroblastic activity which proliferates in an attempt to organize the purulent exudate in the subarachnoid space. The result is the formation of adhesions and the conversion of the leptomeninges into a dense scar through which the cerebrospinal fluid cannot circulate. A series of such cases following sulfonamide therapy has been recorded by Bailey (1945) and the writer has seen several examples following treatment of meningitis with penicillin. Investigation of this problem demands urgent attention because it is of little use sterilizing the cerebrospinal fluid if the patient dies subsequently from the results of an obstructive hydrocephalus. Application of the principles detailed in this paper, and the institution of the intraventricular method of treatment at an early stage will often help to prevent adhesion and abscess formation nevertheless there will still remain a few cases in which adhesions form early in the disease. These cases perhaps, may be aided by pro-

phylactic utilization of some fibrinolytic agent along with the antibacterial drugs.

b Antifibrinolytic action of penicillin Certain organisms which infect the central nervous system possess fibrinolytic properties, which result from the activity of an enzyme complex (fibrinolysin, fibrinase) which they elaborate. Organisms differ in the activity of the fibrinase they produce, fibrinolysis being most active in the case of *Staphylococcus pyogenes* less so with *Streptococcus pyogenes*, and slight with pneumococci and meningococci. Different strains of the same organisms also display differences in fibrinolytic activity some strains being very active, while others (even in the case of *Streptococcus hemolyticus*) being almost inactive.

It has been shown by several workers (Rammelkamp 1942 Wilson 1943 Fleming 1943 1944) that the fibrinolytic activity of *Streptococcus hemolyticus* is inhibited by penicillin. This has been confirmed by Neter and Will (1944). More recently Dixon (1945) has demonstrated that fibrinolysis by *Staphylococcus pyogenes* is also inhibited by penicillin being completely stopped by *in vitro* concentrations of penicillin of 0.1 unit per cubic centimeter and greatly retarded by 0.05 unit per cubic centimeter. The phenomenon is independent of the presence of serum and may reasonably be expected to take place in the cerebrospinal fluid. This antifibrinolytic activity appears to be a property of the active principle of the drug for it is related to the penicillin sensitivity of the organism. With penicillin resistant strains, fibrinolysis is unimpeded by the presence of the drug (Dixon 1945).

Nevertheless, the aforementioned data suggest that the introduction of a fibrinolytic agent, which is not inhibited by penicillin into the cerebrospinal fluid may be an integral part of the treatment of severe intracranial infections.

Cerebrospinal fluid block occurs long before the development of an abnormal response to the Queckenstedt test. One of the earliest indications of the occurrence of a block in intracranial infection is gradually increasing difficulty in obtaining fluid at lumbar puncture, even though it is not obviously purulent (Shalom 1945 Smith Duthie, and Cairns, 1946). Increasing yellowness of the spinal fluid obtained at successive spinal punctures for intrathecal injection is also suggestive of block. Another useful index of a developing block in a patient being treated by intrathecal injection of penicillin is a retardation of the fall off in concentration of the drug in the lumbar fluid. If no block is present the drug is absorbed and diffuses away so that its local concentration falls off decrementally in an exponential manner half concentration being reached in about 4 to 5 hours. Performing serial assays on the lumbar fluid, if a block is suspected (Fig 3) will often reveal that the concentration curve has lost its exponential character and is tending to plateau formation. This suggests a developing block, and occurs long before there is any detectable change in the Queckenstedt response. The higher the plateau the more complete the degree of block.

The development of such a phenomenon is a strong indication for treatment by the ventric

WYKE INTRAVENTRICULAR INJECTION OF PENICILLIN

secondary to brain abscess or suppurating extracranial foci

Cases of posttraumatic infection especially where ventricular penetration has occurred, also fall into this group

The formation of a cerebral or cerebellar abscess is an important complication of primary or secondary intracranial infection and must always be considered in cases in which the disease becomes prolonged or is slow to clear up under medical therapy

The diagnosis of intracranial abscess may present extreme difficulty and will not be considered in detail in the present paper except to stress the value of electroencephalography as a diagnostic aid. Not only may the presence of an abscess be revealed by the appearance of an abnormal rhythm (see Fig. 4) but its location may be indicated by employing the procedures of 'phase reversal' and triangulation. However it should be pointed out in passing that a negative electroencephalographic tracing is not exclusive of abscess formation and for this reason in all suspected cases ventriculography should be carried out as a confirmatory step and penicillin injected into the ventricles through the burr holes introduced during the procedure.

Two types of abscesses occur within the cranium the acute and the chronic (or encapsulated) forms. The recent work of Clovis Vincent (1946) Pennybacker (1945) and Furlow (1945) suggests that the correct treatment of a cerebral abscess is excision after encapsulation has occurred. Direct surgical attack is contraindicated during the preliminary acute phase of abscess formation but it is during this expectant period that penicillin can play an invaluable part especially if introduced directly into the ventricles as well as by other routes. However in the early stages of abscess formation cerebral edema is generally marked and the consequent brain swelling may reduce the performance of a ventricular tap. Nevertheless even if such be the case the introduction of burr holes will permit irrigation of the cerebral subarachnoid space with penicillin solution. As the abscess becomes walled off its contents may be aspirated through a burr hole and its cavity filled with

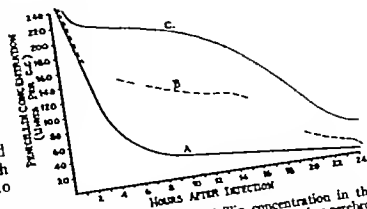


Fig. 3. The course of penicillin concentration in the spinal fluid in cases of meningitis with developing cerebrospinal fluid block, as determined at serial lumbar punctures. As the block develops the absorption curve loses its exponential character and becomes plateau-like. A The normal curve in cases of meningitis without block, B the curve in cases with an early developing block, C, the curve in cases with complete cerebrospinal fluid block.

penicillin solution and finally, when encapsulated it may be removed by radical excision together with any brain tissue that is obviously infected (King 1924 Fincher 1946 Sachs 1946). Excision of the abscess should be immediately preceded by intrathecal and intraventricular injection of penicillin as a prophylactic preoperative measure (qv) in some cases marsupialization of the abscess may be carried out.

Electroencephalography again is useful in following the transition of an acute cerebral abscess into the encapsulated form and the performance of serial electroencephalographic examinations during the waiting period helps to determine when the critical time for operation has been reached.

6 Any case of intracranial infection with streptococci

Any case in which streptococci are identified in the cerebrospinal fluid is a potential case of cerebral abscess. Smith Duthie and Cairns (1946) found 6 of 8 consecutive cases of streptococcal meningitis to have a cerebral abscess. Streptococci in the cerebrospinal fluid therefore demand ventricular puncture and ventriculography and serial electroencephalograms where possible. If an abscess is found direct introduction of penicillin into the ventricles and abscess cavity along the lines here indicated is essential. Even if no abscess is found, repeated intraventricular

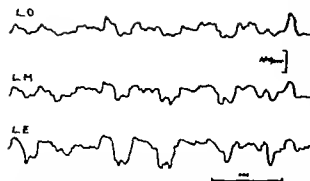


Fig. 4. A electroencephalogram showing high voltage (25 mV) slow (2-3 c/sec.) delta waves, such as are seen in the region of cerebral abscess formation after encapsulation. A tracing of this type is an indication for treatment along the lines described in this paper. The record is taken with monopolar leads in the left frontal, motor and occipital regions.

jection of penicillin is the best method of treatment in all cases of streptococcal intracranial infection. No patient with streptococcal meningitis should ever be subjected to lumbar puncture twice after it has been identified as such (Smith, Duthie, and Cairns 1946) the direct ventricular route should immediately be resorted to.

7 Cases in which intracranial operations are to be carried out upon or in the presence of potentially infected foci

Intraventricular injection of penicillin may be used prophylactically as a preoperative procedure, combined if necessary with intraspinal administration of the drug. Its use has been already referred to and Cairns (1945) recommends that a single dose of 4000 to 8000 Oxford units be injected into the ventricles prior to operations for (a) removal of chronic brain abscess, (b) closure of a cerebrospinal fistula, (c) dural repair after orbitofrontal or nasofrontal wounds or lesions involving the petrous temporal bone. This procedure should be used more often as a preliminary to surgical attack on potentially infected craniocerebral wounds particularly those in which intracerebral foreign bodies are present. Cerebrospinal rhinorrhoea is an especial indication for repeated intraventricular injection of penicillin which should be commenced immediately the condition is manifest and continued after its operative treatment.

To conclude this section of the paper the groups of cases which the author believes to

indicate the use of repeated intraventricular injection of penicillin solution are summarized below.

1 Any case of purulent intracranial infection with a penicillin sensitive organism, in which the cerebrospinal fluid pressure and cell counts are high.

2 Any case of intracranial infection with highly virulent or partially penicillin sensitive organisms, especially in children.

3 Any case of intracranial infection with a penicillin sensitive organism which fails to show early and progressive improvement under medical treatment.

4 Any case of intracranial infection with a penicillin sensitive organism in which cerebrospinal fluid block is suspected.

5 Any case in which intracranial abscess formation is suspected.

6 Any case of intracranial infection in which streptococci are found in the cerebrospinal fluid.

7 Any case in which intracranial operations are to be carried out in the presence of potentially infected foci.

8 Any case of head injury that develops cerebrospinal rhinorrhoea.

9 Any case of intracranial infection with a penicillin sensitive organism that develops papilledema.

10 Any comatose case of intracranial infection.

TECHNICAL CONSIDERATIONS.

4 Operative procedure The initial operation is the same as that for the performance of ventriculography two burr holes being introduced into the skull under local anaesthesia, either in the parietal or frontal regions. The diploe of the bone is first inspected for evidence of osteomyelitic infection. The dura is seen in the depths of the burr holes, and, after inspection for evidence of epidural infection or abscess formation is opened with a fine knife and hook. In some cases a subdural empyema may be found overlying the brain (Kubik and Adams, 1943; Spitz and others, 1945). If present this may be drained, and a fine rubber tube inserted and left *in situ*, through which penicillin may be repeatedly instilled into the subdural space. If epidural

or subdural infection is present no attempt should be made to needle the ventricle through the infected locus on that side the opposite side should be utilized.

Brain needles are then passed into the lateral ventricles and the contained fluid is aspirated. A rough qualitative estimate of the intraventricular pressure can be made and compared with that on the opposite side, and the depth at which the ventricle was tapped should be read off from the centimeter scale on the brain needle, as it provides an estimate of the size of the ventricle. A separate needle should be used to tap each ventricle.

The cerebrospinal fluid obtained from each ventricle should be collected in separate sterile containers, and examined individually for volume, turbidity, cell count, protein content and organisms, as this furnishes valuable evidence of the presence or absence of intraventricular block. Further evidence of this and the patency of the foramen of Monro may be adduced by washing sterile Ringer's solution through from one ventricle to the other with both brain needles in place, or by the introduction of methylene blue or filtered gas into one ventricle to see if it will pass to the opposite ventricle. If the fluid obtained from one or both ventricles be turbid, as much of it as possible should be removed by gentle aspiration with a syringe if necessary, and the ventricles should be washed out with warm sterile Ringer's solution until the returning fluid is clear.

If ventriculography is to be performed 10 to 20 cubic centimeters of filtered air or oxygen are injected into one (or both) ventricles, the brain needles withdrawn and the scalp wounds sutured.

The patient remains on the operating table and the requisite radiographic pictures are taken. This procedure outlines the ventricular system disclosing any asymmetry or displacement indicative of an abscess, and assists in the diagnosis of intraventricular block.

When satisfactory films have been obtained the patient still on the operating table, is returned to the theater and a fresh brain needle is introduced into each ventricle through the closed scalp wounds. The con-

tained air is aspirated with a syringe, and 3 to 5 cubic centimeters of penicillin solution containing 10,000 units to the cubic centimeter is injected after dilution with 5 to 10 cubic centimeters of warm saline, if desired. At first, in view of reports of reactions to intrathecal injection of concentrated penicillin solutions (*vid sup*) high dilutions were employed for intraventricular injection of the order of 500 to 1000 units per cubic centimeter, Cairns (1945) recommended 2000 units per cubic centimeter. Now however "pure" penicillin solution as supplied by The Commonwealth Serum Laboratories in concentrations of 10,000 units per cubic centimeter is injected without further dilution directly into the ventricles in amounts of up to 5 cubic centimeters, no reactions to this procedure have been seen on the now numerous occasions on which this has been done, even in babies.

B Postoperative management. On completion of this procedure the patient is returned to bed after the wound is dressed and subjected to the usual postoperative routine. A course of systemic sulfadiazine (4 gm *statim* then 2 gm in 4 hours, and 1 gm. fourth hourly thereafter) is begun, if not already commenced. If desired parenteral administration of sulfonamide may be instituted in the early critical stages. Fluid balance charts are rigorously kept and fluids given by intragastric or intravenous drip methods on the slightest pretext.

Some of these patients become very restless or even delirious following the preliminary operation and should be restrained with cuffs on legs and arms and bedrails if necessary. Sedation may be accomplished with repeated intramuscular injections of dial in doses of 1 to 2 cubic centimeters with or without paraldehyde given orally or *per rectum*. In very restless patients, especially if at all dehydrated a Ryles tube may be passed and left *in situ* after restraint has been arranged and through this fluids and paraldehyde may be introduced as required.

In those cases in which there is persistent cerebral edema especially those that have preoperative papilledema, in which the cerebrospinal fluid pressure often remains high rectal hypertonic solutions may be given. For

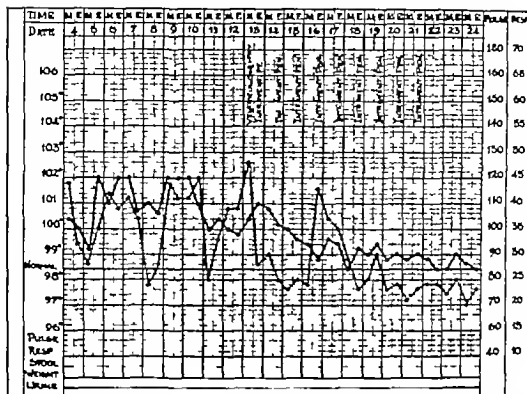


Fig. 5. The clinical chart of case of purulent meningitis and ventriculitis due to *Staphylococcus aureus*, treated with 9 daily intraventricular injections of penicillin. The rapid recovery following institution of this method of treatment is well seen. The clinical course prior to this was fluctuating, with gradual trend for the worse under a month's medical treatment with sulfonamides and systemic and intrathecal penicillin (from Wyke and Vanderfeld, 1946) Pulse, black line, temperature later ruptured line.

adults 6 ounces of magnesium sulfate in 50 per cent solution may be given every 8 to 12 hours and retained. In the case of young children and babies, a rectal hypertonic saline solution is used prepared in the following manner: 6 drachms of 17½ per cent saline solution are made up to 2 ounces with distilled water making a sufficiently hypertonic solution which can be given at repeated intervals until the pressure inside the skull returns to normal. A useful indication of cerebral edema, which may be marked postoperatively is a rapid fall in cerebrospinal fluid pressure after withdrawal of only a small volume of fluid at spinal drainage. If cerebral edema is marked treatment by spinal drainage is of little avail and intravenous injections of up to 50 cubic centimeters of hypertonic sucrose should be given.

Each day in the ward a brain needle is introduced into the alternate ventricle (if

there is no block) or into both ventricles (if there is an intraventricular block) and the cerebrospinal fluid gently aspirated with a syringe. A cell count and culture is done on each specimen of fluid removed each day for control purposes and the results graphed, if required. Such a graph (of the pressure and cell count) is a useful index of the efficacy of treatment. After the fluid is removed the ventricle is washed out with warm Ringer's solution and the penicillin is introduced in the same strength and amount as before. Then the wound is redressed.

A mask should be worn and sterile gloves donned before commencing the procedure. The patient is postured on his side, with the head flat and slightly flexed so that the burr hole to be tapped is uppermost. The dressings are then removed with sterile forceps by a nurse, and the field is swabbed with metaphen and covered with a sterile area sheet. The

sutures in the wound are not interfered with, the burr hole being easily found with the point of the brain needle. At the same time lumbar puncture may be performed and penicillin instilled intrathecally, although in most cases this is an unnecessary adjunct.

The procedure detailed is repeated daily until the cerebrospinal fluid pressure falls to normal limits and the fluid becomes clear, the cell count in the ventricular fluid is within normal limits, and the cultures of fluid from each ventricle are sterile on three successive occasions. Considerable improvement is usually apparent within 2 to 4 days and in most cases not more than 6 to 9 intraventricular injections are required. A typical result from 9 such injections is seen in the clinical chart in Figure 5.

The performance of daily intraventricular injection in the ward is not dangerous if carried out with the strictest aseptic routine, and has been done many times by the writer without mishap. It should only be performed however, by an operator skilled in the procedure. Theoretically the greatest danger is the introduction of contaminant organisms into the cranium that may be penicillin resistant or penicillinase producers; this has never occurred in any of our cases.

The burr holes should be made well away from the cerebral motor region in case an intracerebral abscess forms along the track of the needle, leading to gliosis and cerebral scar formation and the possibility of subsequent epilepsy. This is especially important in children but may be avoided by using only frontal or parieto-occipital burr holes, and by withdrawing the brain needle on every occasion while actually injecting the penicillin solution. In babies the procedure of ventricular injection may be carried out by puncturing the lateral angles of the superior fontanel with a fine steel needle, but the writer feels that perhaps even in these cases burr holes should be employed in view of the possibility mentioned above.

SUMMARY

1 The factors controlling the passage of penicillin through the blood-brain barrier are discussed in the light of previous experience

and the results obtained by the writer in a series of cases. It is concluded that therapeutically adequate concentrations of penicillin cannot be maintained for sufficient time in the cerebrospinal fluid by systemic administration of the drug.

2 The historical features of the development of the procedure of direct introduction of penicillin into the cerebrospinal fluid are reviewed.

3 Possible complications of the procedure are discussed and shown to be avoidable and of small significance if proper care is exercised.

4 Certain clinical criteria which the writer considers to indicate repeated intraventricular administration of penicillin are enumerated and discussed.

5 The operative procedures and post-operative management of cases thus treated are described.

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THE SIGNIFICANCE OF SKIN RECURRENCES FOLLOWING RADICAL MASTECTOMY

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RECURRENCE as related to cancer implies the persistence and eventual clinical manifestation of disease not eliminated at the time of treatment. Therefore the recurrence of breast carcinoma in the structures of the chest wall following breast removal indicates that tumor tissue, microscopic in size, was left behind at the time of operation. There has been considerable discussion regarding the influence of wide skin removal on the subsequent development of skin recurrences. However, there appears to be some confusion as to the true etiology of skin recurrences and their significance in relation to treatment and prognosis of carcinoma of the breast. It is with this aspect of the problem that this paper is primarily concerned. Twenty six cases of carcinoma of the female breast in which the patients were subjected to radical mastectomy and later developed skin recurrences form the basis of this presentation.

Since it is well recognized that the problem of breast carcinoma is intimately related to the lymphatic drainage of the breast, it is appropriate to review briefly at the outset this somewhat intricate anatomy.

Rouvière describes the cutaneous lymphatics of the mammary region as follows. In the region of the nipple and areola, the lymphatic capillaries form a dense network, the areolar network, which consists of several planes continuous with the superficial cutaneous plexus of the thoracic integument (papillary lymphatic plexus of the skin). From this network arise small lymph vessels which empty into a subdermal plexus, the subareolar lymph plexus. The subareolar plexus receives a large portion of the lymphatics from the breast and gives origin to the great afferent lymph trunks from the mammary gland proper. In the outer circumference of the areola, the subareolar plexus

becomes less dense, and its meshes enlarge to form the circumareolar plexus. This plexus merges into the same lymphatic capillary network as the other cutaneous lymphatics draining the anterior thoracic wall and presents the same lymph node connections—that is, the collecting vessels which drain the thoracic cutaneous network converge from the median line and the anteroinferior part of the thorax upon the axilla, penetrate it and empty into the external mammary group of lymph nodes, chiefly the superior group.

In addition to this principal path of collection, there are three secondary paths of drainage: (1) the supraclavicular lymph nodes, (2) collecting vessels which originate in the median portion of the anterior thoracic wall accompany the perforating rami of the internal mammary artery, transverse the pectoralis major and intercostal muscles, and finally empty into the internal mammary chain of nodes, and (3) the group of collecting vessels called by Rouvière, the anterolateral lymphatic path, which cross the midline preternally and run from the integument of one breast to the axilla of the opposite side. This third path was demonstrated by Oelsner. It provides the means by which contralateral axillary nodes may be involved independently of a new primary tumor in the opposite breast.

The cutaneous lymphatic network of the anterior thoracic wall is continuous with the cutaneous network of adjacent regions such as the abdomen, the neck, and the upper extremities. This arrangement described first by Sappey and then by Handley, was well demonstrated by the classical experiment of Kolodoy, who incised the pectoralis major muscle of one side transversely, injected carmine into the caudal portion of the muscle, and noticed that the carmine appeared in the contralateral axillary and inguinal lymph nodes and in both groups of

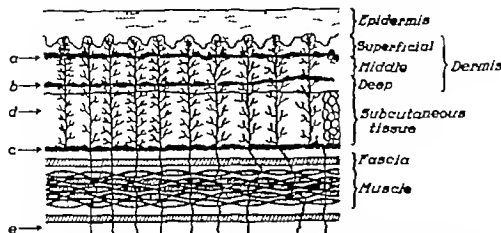


Fig. 1. Diagram showing the anatomical positions of the various plexuses: *a*, superficial cutaneous plexus or Sappey's subpapillary plexus; *b*, deep cutaneous plexus of Arnold; *c*, superficial fascial plexus, the chief path of lymphatic drainage from the breast and surrounding skin; *d*, vertical lymphatic trunks to the dermal papillae; *e*, deep vertical trunks to the underlying structures.

The main plexus into which the cutaneous lymph drains is the so-called superficial fascial plexus. The circumareolar plexus merges with this plexus and is thereby continuous with the cutaneous lymphatics of the entire thorax and adjoining regions. As mentioned previously continuity is evident from Kolodny's experiment, in which retrograde lymphatic flow was initiated. In the mammary region the superficial fascial plexus lies in the retromammary and deep subcutaneous tissue just superficial to the fascia of the pectoralis major muscle. Numerous small lymphatic capillaries arising in the papillae of the dermis converge forming larger vertical vessels which empty into it.

There has been considerable controversy in regard to the superficial cutaneous plexus (Sappey's subpapillary lymphatic plexus). Rouvière indicates that the areolar plexus merges with this network. Handley on the other hand was unable to demonstrate a superficial plexus in the dermis and felt that there is a complete independence of adjoining 'lymphatic areas' of the skin which he estimated to be $\frac{1}{8}$ to $\frac{1}{2}$ inch in diameter. In other words Handley's conception likened the vertical trunks draining into the fascial plexus to a forest of trees with many branches, none of them connecting with each other.

This anatomical picture is further confused by the frequent description of another lymphatic network, the deep cutaneous plexus located at the junction of the middle and deep

thirds of the dermis. The anatomical positions of these various plexuses are shown diagrammatically in Figure 1. Dermatologic pathologists are likewise divided in their ability to demonstrate either Sappey's or Arnold's cutaneous plexuses, but they are in general agreement that the most important path of drainage from the skin is by the superficial fascial plexus.

While the value of radical mastectomy established by Halsted and Willy Meyer, is unquestioned in the treatment of carcinoma of the breast there has been little agreement regarding the method of dealing with the skin. The disagreement seems to be intimately concerned with the various concepts of spread of carcinoma within and beyond the limits of the breast. These concepts are obviously related in turn to the respective interpretations of the anatomical considerations of the cutaneous lymphatics in the mammary region.

One of the early workers to study the spread of breast cancer was Handley. His classical work is probably the most often quoted but at the same time it has received widespread criticism. Handley concluded that the growth of breast cancer to the skin was chiefly by permeation into the lymphatics of the superficial fascial plexus with later extension upward into the vertical skin lymphatics to form clinically visible skin nodules. Heidenhain and Handley showed that permeation of the fascial lymphatic plexus from the primary

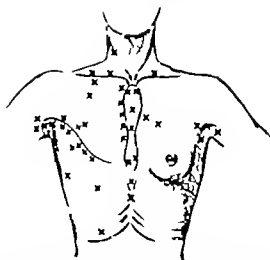


Fig. 2. Diagrammatic illustration of the most common sites of skin nodules. For convenience in diagramming the right side is assumed to have been the site of primary involvement in all cases.

mammary carcinoma may occur relatively early in the disease and often before the breast is demonstrably fixed to the pectoral fascia. Handley by no means denied the possibility of lymphatic embolic dissemination. In fact, he stated that the axillary and regional lymph nodes are often involved as a result of tumor emboli thus producing retrograde lymphatic flow. Handley believed that skin nodules appearing over the area where the deep fascia had been excised were simple "efflorescences without bad prognosis, but that skin recurrences over the intact fascia indicated proliferating growth and certain death. However as will be indicated later it would appear that efflorescent recurrence is either rare or without appreciably different outlook.

As a result of his studies Handley practiced and taught relatively narrow skin excision but wide peripheral dissection of the fascia and the subcutaneous level where he assumed the tumor to be permeating. Several workers notably Cheattle have taken exception to Handley's permeating theory. As evidence they have shown that sections cut serially from the infiltrative edge of the primary growth to the regions of metastatic growth will show intervening areas where no permeated lymphatics can be found. This is conclusive evidence according to these investigators, that spread is

by emboli in the lymphatics and not by permeation. Gilchrist and David in their work on carcinoma of the rectum, further emphasized evidence pointing toward spread by emboli. Handley defended his permeation theory by explaining those intervening areas which were free from permeated lymphatics to be the result of a defensive action of the invaded tissue resulting in "perilymphatic fibrosis. However Handley's major contribution has been to emphasize the importance of the superficial fascial plexus as the route by which cancer of the breast gains widespread dissemination to the skin and surrounding regions.

Willis agrees that permeation of breast carcinoma may occur upward from the fascial plexus in the manner described by Handley and may thereby produce skin nodules. However Willis, as well as Daus and Miescher places equal importance upon tumor emboli in retrograde lymphatic flow caused by blockage of regional lymph nodes and deep lymphatics. Willis also states that secondary embolic foci may serve as the origin of further permeation. In addition several references to apparently genuine case reports of hemic dissemination of breast cancer to the skin are given in Willis' book. Batson likewise, after working with ink injected material also emphasizes the fact that venules as well as lymphatics may serve as paths of dissemination to the skin. Willis concludes that skin metastases from carcinoma of the breast do not result from lymphatic permeation or emboli or hemic dissemination alone, but are in varying degree the result of all of these routes.

Stiles, writing in 1892 of his findings after using osmic acid fixation of the breast in normal and pathologic conditions showed a clear understanding of the dissemination of breast cancer. His observations led him to conclude that the efferent lymphatics of the corpus mammae of the fat around it and of the nipple areola and skin over it open either directly or indirectly into the lymphatics of the deep fascia.

Stiles denied Sappey's contention that two or three collecting lymphatic trunks leading from the subareolar plexus are the ultimate and only channels for the receipt of lymph from all parts of the breast. He was able to demonstrate clearly small foci of tumor

TABLE I—CORRELATION OF PREOPERATIVE CLINICAL FINDINGS AND POSTOPERATIVE RECURRENCE OF TUMOR

Case No.	Pregnancy or lactation	Extensive edema	Staphylococci	Intraaxillary or paraxillary nodules	Edema of arm	Fixed axilla, etc.	Indurated axilla	Dermal metastases	Axillary lymph nodes more than 5 cm.	Ulceration of skin	Edema of less than half of breast	Tumor fixed to chest wall	Fixed axillary nodes	Case No.	Operable	Type of closure	Follow-up result	Remote metastases?
1	-	-	-	-	-	-	-	-	-	-	-	-	-	1	No	Graft	Dead	Yes
2	-	-	-	-	-	-	-	-	-	-	-	-	-	2	Yes	Primary	Dead	Yes
3	-	-	-	-	-	-	-	-	-	-	-	-	-	3	N	Graft	Dead	Yes
4	-	-	-	-	-	-	-	-	-	-	-	-	-	4	Yes	Primary	Alive	Yes
5	-	-	-	-	-	-	-	-	-	-	-	-	-	5	N	Graft	Dead	Yes
6	-	-	-	-	-	-	-	-	-	-	-	-	-	6	No	Primary	Dead	Yes
7	-	-	-	-	-	-	-	-	-	-	-	-	-	7	Yes	Primary	Dead	Yes
8	-	-	-	-	-	-	-	-	-	-	-	-	-	8	?	Graft	Dead	Yes
9	-	-	-	-	-	-	-	-	-	-	-	-	-	9	Yes	Primary	Dead	Yes
10	-	-	-	-	-	-	-	-	-	-	-	-	-	10	Yes	Primary	Dead	Yes
11	-	-	-	-	-	-	-	-	-	-	-	-	-	11	Yes	Primary	Dead	Yes
12	-	-	-	-	-	-	-	-	-	-	-	-	-	12	N	Graft	Dead	Yes
13	-	-	-	-	-	-	-	-	-	-	-	-	-	13	N	Graft	Dead	Yes
14	-	-	-	-	-	-	-	-	-	-	-	-	-	14	N	Graft	Dead	Yes
15	-	-	-	-	-	-	-	-	-	-	-	-	-	15	N	Graft	Dead	Yes
16	-	-	-	-	-	-	-	-	-	-	-	-	-	16	Yes	Primary	Dead	Yes
17	-	-	-	-	-	-	-	-	-	-	-	-	-	17	N	Primary	Dead	Yes
18	-	-	-	-	-	-	-	-	-	-	-	-	-	18	N	Graft	Dead	Yes
19	-	-	-	-	-	-	-	-	-	-	-	-	-	19	Yes	Primary	Alive	Yes
20	-	-	-	-	-	-	-	-	-	-	-	-	-	20	Yes	Primary	Dead	Yes
21	-	-	-	-	-	-	-	-	-	-	-	-	-	21	Yes	Primary	Dead	Yes
22	-	-	-	-	-	-	-	-	-	-	-	-	-	22	Yes	Graft	Alive	Yes
23	-	-	-	-	-	-	-	-	-	-	-	-	-	23	Yes	Graft	Alive	Yes
24	-	-	-	-	-	-	-	-	-	-	-	-	-	24	Yes	Primary	Dead	Yes
25	-	-	-	-	-	-	-	-	-	-	-	-	-	25	Yes	Graft	Alive	Yes
26	-	-	-	-	-	-	-	-	-	-	-	-	-	26	Yes	Primary	Alive	Yes

located in the deep lymphatics remote from the primary tumor and depending for their origin upon the arrest growth of cancerous emboli. Since the diffuse anastomoses of the lymphatic vessels of the fascial plexus between the mammary and surrounding regions were well known to Stiles, it is not surprising that he wrote at this early date of the importance of removing the retromammary tissue, axillary fat and nodes pectoral and axillary fascia, along with the breast in all cases of carcinoma. He concluded that it is impossible to predict toward which regional lymph nodes the cancer

emboli from any given point of the breast may be conveyed.

It is clear that the lymphatic drainage of the breast is in intimate relation with that of the overlying skin as well as with the skin of the surrounding regions through the rich anastomoses of the subareolar plexus into the circumareolar plexus and finally into the superficial fascial plexus. The superficial fascial plexus is of prime importance in that it serves as the largest afferent lymphatic group from the mammary gland and the skin of the entire body to the regional nodes. Cancer cells from

the primary growth in the breast readily penetrate the lymphatic vessels and may permeate them for varying distances. Emboli from these invasions are broken off and swept to the axillary lymph nodes grow there, and often completely block the cortical sinuses to further lymph drainage. In consequence, retrograde lymphatic flow may occur and because the anastomoses of the fascial plexus are so extensive, tumor emboli can be carried to areas remote from the primary tumor as, for example, to an ipsilateral inguinal lymph node. As Stiles indicated and Kolodny demonstrated it is impossible to predict how far reaching such a process may be. The emboli may lodge as small foci in the fascial lymphatics only to permeate later into the vertical skin lymphatic capillaries, or they may be swept directly into the vertical skin vessels.

It would appear therefore, that much of the recurrence of tumor in the skin originates from malignant cells present in the fascial plexus, and that these malignant cells are capable of spreading to surrounding anatomical regions. Undoubtedly some skin nodules are the result of direct permeation of the deep lymphatics and vertical spread into the cutis without the aid of embolization. Hemic dissemination probably accounts for a small percentage of skin recurrences. All of these methods of spread would appear to be operative in the production of local recurrences. To attempt to define closely the exact route in each instance is of academic interest only. The important thing to be borne in mind is that the superficial fascial plexus serves as the primary route of lymph drainage from the skin of the mammary region as well as the breast itself and because of the extensive anastomotic potentialities of this plexus combined with retrograde lymphatic flow skin recurrence by any route necessarily implies true metastases.

Another factor concerns the involvement of axillary lymph nodes by tumor. As has been indicated extensive lymph node involvement is often followed by retrograde lymphatic flow. Since the incidence of axillary metastases is extremely high in patients developing skin recurrence, it seems probable that retrograde embolization is frequently responsible for the skin recurrence.

Although there are several instances in the literature in which excision of skin recurrences near the operative scar was followed by freedom from further disease for as long as 10 to 15 years such instances are extremely uncommon and suggest the occasional inoculation of tumor cells at the time of operation. Unusual happenings of this nature probably contribute little to an understanding of the real problem.

Lewis and Rienhoff in reporting the results of radical mastectomy for carcinoma of the breast at Johns Hopkins Hospital from 1894 to 1931 consider that local recurrences represent either inoculations at the time of operation or uninterrupted tumor in the cutis that was transected at operation. They have substituted the term 'regional metastases for regional recurrences,' though this seems paradoxical considering their own interpretation of skin recurrence. The outcome of their studies, in line with the principles laid down by Halsted has been the technique of wide skin excision followed by a Thiersch graft over the operative defect. Lewis and Rienhoff conclude in their paper that 'regardless of the extensiveness of the disease, so long as it remains confined within possible operative limits, it is incumbent on the surgeon to perform the most radical and meticulous operative procedure, including a far wider excision of skin than has been customary in even the Halsted Thiersch graft procedure as performed in the majority of instances in the past, for it is only by this method that the proper amount of skin and subcutaneous tissue will be sacrificed. There alone exists the possibility of reducing local recurrences to a minimum.

Another school of thought led by Auchincloss agrees with the Halsted principles but believes that they do not go far enough, as the spread of cancer peripheral to the excised skin takes place in the tissue immediately beneath the cutis. Therefore, a more careful and painstaking dissection of the remaining skin around the excision must be made so as to leave no fat attached to the undersurface of the skin.

White and his co-workers have renewed interest in the work of Handley. White considers, as do most surgeons, that a primary closure is preferable to skin graft if it does the patient no harm. He states that a minimum

width of 15 centimeters of skin should be removed and that by liberal undercutting the flaps can usually be easily approximated without undue tension. He believes that the advocates of skin grafting have adopted an empirical attitude that is not yet supported in fact.

Though it has been rather widely implied that the incidence of postmastectomy skin recurrence is in general a reflection of the operative technique, little has been done in retrospective study of other underlying factors which might influence the later development of skin recurrence, or in consideration of whether by means of excessively wide skin removal any material gain is accomplished in increasing the long term survival of patients.

Out of 450 cases of carcinoma of the breast from the records of the Ellis Fischel State Cancer Hospital we found 26 cases of biopsy proved skin recurrence developing in or adjacent to the operative field in patients that had had radical mastectomies. It is on these 26 cases that our discussion is based. No attempt has been made to calculate percentage recurrence since in many of the 450 cases sufficient time has not elapsed for the appearance of future inevitable skin recurrences.

The average incidence of local recurrence following radical mastectomy can be obtained from a general review of the literature. Lewis and Rienhoff report a rate of 26.6 per cent in 541 patients who had careful follow up attention. In White's series of 254 patients 23.5 per cent developed local recurrence. Hoopes and McGraw report a 15 per cent local recurrence in 246 patients. Rodman reports the extremely low rate of 2.2 per cent local recurrence in 132 patients of whom 61 per cent survived for at least 5 years. It should be noted, however, that these patients were personally selected. Other contemporary writers generally report figures of 10 to 30 per cent local recurrence. It is interesting to note that prior to the initiation of the radical mastectomy operation for carcinoma of the breast surgical masters like Billroth, Czerny, Fisher and Gussenbauer reported local recurrences in 62 to 82 per cent of their patients.

In reviewing our cases we have attempted to determine what correlation exists between certain preoperatively recognized clinical find-

ings known to influence adversely the prognosis of breast carcinoma and the subsequent manifestation of recurrences. Table I shows the clinical findings and the operative sequelae.

In 4 cases (Nos. 5, 6, 14, 15) operation may be considered to have been hopeless. These patients presented initially suspected and later obvious distant metastases. Operation was performed in order that the patients might receive the benefit of the existing doubt in regard to the suspected metastatic disease. If one accepts the summation of local factors constituting inoperability as outlined by Stout and Haagensen, in 6 additional patients (Nos. 1, 3, 11, 13, 17, 18) the cancer might have been considered inoperable, bringing the total to 10. All of these patients have now died of generalized disease, pulmonary metastases being present in 8 of the 10. Of the remaining 16 patients 8 presented at least one highly unfavorable clinical sign. Ten of these 16 are dead of carcinomatosis and all of the remaining 6 patients still living have shown remote disease and may be expected to succumb to the cancer in due course of time.

It has been repeatedly shown in published reports that the incidence of local recurrence is greatly increased when axillary metastases are present (16, 17, 18, 19, 20). Warren and Tompkins have produced some interesting data on this point. They have shown that skin recurrences are three times more common when axillary nodes are invaded by tumor and that the incidence of skin recurrence increases in direct proportion to the percentage of lymph nodes involved by disease. In their series there was only a 7 per cent skin recurrence when no axillary lymph nodes were involved but a 21 per cent skin recurrence when all of the axillary nodes were invaded. They maintain that it is reasonable to suppose that patients in whom metastases have occurred to the axillary lymph nodes should also have other metastases to the skin over the chest wall, thus increasing the likelihood of recurrence in the scar. They interpret their data to suggest that local recurrences are of the nature of metastases rather than implants. In emphasis of this interpretation Warren and Tompkins note that the patients in their series who had no axillary lymph node involvement

TABLE II

No. patients	Total nodes involved	N nodes dissected	
	Per cent	Average	Range
		7	4-20
0	less than 5	20	8-20
	5-20	5	
6	20-75	14	9-25
4	75-90	20	7-27
4	100		10-26

but who developed skin recurrence (a total of 8) died of widespread metastatic cancer.

Table II gives, in rough figures, the per centage of axillary lymph nodes found to contain cancer in our patients. Only 2 of the 26 patients were free from apparent metastases to the axillary lymph nodes, as determined by examination of the operative specimen. In 1 of these patients, only 4 lymph nodes were examined, so that it cannot be definitely stated that there were no metastases. Only 2 of the 15 patients in whom 25 per cent or more of the lymph nodes were involved are still living. On the other hand 4 of 11 patients with less than 25 per cent of the axillary nodes involved are still living, though all have widespread disease.

In general our policy has been to excise as much skin as is compatible with primary closure except where other considerations such as a small breast, a large tumor or a tumor superficial in the breast or involving the skin are present. Fourteen of our patients required skin grafting and 12 had flap closure of the wound. It is not our purpose to contribute to the controversy regarding what constitutes adequate skin removal. However it is difficult to imagine what skin grafting contributed to the overall prognosis in the 14 patients in whom it was carried out or what flap closure contributed in the other 12.

The location of the skin nodules is shown diagrammatically in Figure 2. It is seen that the most common site of recurrence is along the margin of the scar or at the periphery of the grafted area. One would expect this site to be the most frequent on the basis of simple mechanical dynamics. Handley explained the

TABLE III.—TIME AVERAGES

() From operation to appearance of nodules	14.4 mos
(a) Skin graft cases	3.9 mos
(b) Primary closure cases.	16.5 mos.
() From operation to death (20 patients)	21.3 mos
(3) From operation to time of writing, for those alive (6 patients)	35.5 mos
(4) From appearance of skin nodules to death	10.8 mos.
(5) From appearance of skin nodules to time of writing	2.1 mos.
(6) Average age	
(a) All 26 patients	51.7 years
(b) Patients living (6)	55.7 years
(c) Patients dead (20)	50.6 years

fact that recurrences are found most frequently near the site of the primary tumor on the basis of a centrifugal spread of cancer. The next most frequent site is over and parallel to the sternum. The collecting lymphatic vessels which accompany the perforating branches of the internal mammary artery undoubtedly account for most of the recurrences along the sternum. These lymphatic vessels are in direct communication with the superficial fascial lymphatic plexus. Less often involved areas are found in and near the axilla and supraclavicular regions of the same side. Several of our patients developed skin nodules in or around the axilla of the opposite side.

The averages of various time intervals relative to our series are listed in Table III.

CONCLUSIONS

While radical mastectomy has been universally adopted as the most effective method of dealing with carcinoma of the breast, the reported incidence of skin recurrence following this procedure remains at between 10 and 30 per cent. Surgeons, in an attempt to lower this incidence, have proposed many technical maneuvers and variations in procedure, usually aimed at increasingly wide skin removal. However it appears that such technical attempts at elimination of local recurrence are of little value in effecting a cure of carcinoma of the breast. Our study of the 26 patients at the Ellis Fischel Hospital who developed skin recurrences following radical mastectomy clearly shows that the tumors present in these cases were advanced and aggressive. Indeed, in 10 of the 26 patients there was evidence of such advanced disease that operation might have

been considered futile by generally accepted clinical criteria of operability

Therefore, it would appear to be a proper concept that skin recurrences indicate that not all of the carcinoma was accessible to the surgeon at operation regardless of how radical his procedure, and that the cancer was inoperable.

This concept is based upon the fact that the route of metastasis of breast carcinoma to the skin is usually by the superficial fascial lymphatic plexus with vertical growth into the skin. Permeation as proposed by Handley and embolization in retrograde lymphatic flow are probably the chief modes of metastasis the latter appearing to be the one of primary importance. When the axillary lymph nodes are uninvolved and yet skin metastases appear later it may be assumed that hemic embolization direct lymphatic permeation or independent lymphatic embolization without retrograde flow was the manner of dissemination (20) By any of these means it may be anticipated that remote metastases may also develop. Although there can be little question that recurrences may also result from direct implant of tumor cells this would seem to happen quite rarely and in all likelihood is usually associated with wide lymphatic involvement as well.

The safe amount of skin to be removed in radical mastectomies has given rise to great disagreement. Bearing in mind the lymphatic system of the breast and surrounding integument incision of the skin at a distance beyond the tumor equal to the distance permitted between the tumor and the chest wall should provide more than ample skin removal. Wide skin excision although it might conceivably diminish the clinical manifestation of skin recurrences would not in our opinion improve the 5 year survival of patients. This conclusion is borne out by careful comparison of the reports of those who regularly practice skin grafting and those who do not. If lymphatics of the superficial fascial plexus have become involved either by embolic arrest or permeation wide skin removal does not prevent recurrence

It seems reasonable to conclude that skin recurrence is but the indicator of the recrudescence of more widespread disease already clinically apparent or soon to become so. It is our opinion that treatment of the recurrence, either surgical or radiotherapeutic, adds little or nothing to patient's life expectancy.

Thus, decreasing the incidence of skin recurrence would appear to be dependent among good surgeons not on the commonly discussed variation in surgical technique but on the earlier diagnosis and surgical treatment of breast cancer and on the adherence to even narrower criteria of operability than have been previously followed. In fact it is believed by some workers (19) that patients with advanced but still technically resectable carcinomas live less long after operation than do those who are refused radical mastectomy.

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EDITORIAL

SURGERY Gynecology and Obstetrics

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SEPTEMBER, 1947

THE IMMEDIATE CARE OF NERVE AND TENDON INJURIES

FEW types of injury can impose a greater handicap upon the working man or the boy or girl beginning the active years of life than a deep laceration of the palm or forearm with division of nerves and tendons. It is in these two groups, in particular that such injuries are most likely to occur. The workman handling metal plates and strips, working with glass sheets or bottles or with heavy machinery with shearing edges, the youngster at play falling with a bottle or tumbler clasped tightly in his hand or pushing his forearm through a glass door or window, the adventurous schoolboy rummaging in fascinating heaps of discarded tin cans, automobile fenders and glass containers, and the luckless individual of any age involved in an automobile accident—any one of them can confront the surgeon and at any hour with a

severe injury that taxes both his surgical judgment and his surgical skill.

As with every surgical procedure an accurate preoperative diagnosis enables the surgeon to work effectively and with assurance. No one emphasized this fact more clearly in his writings and teachings than the late Torrey Harmer of Boston or described more clearly how with a few simple tests of movement and of sensory function, and usually without removing the first aid dressing, the surgeon could recognize with certainty the division of nerves and tendons and identify which were injured and which intact.

When one is suddenly confronted with a deep wound in which the tissues are uniformly discolored with blood and in which all the anatomical structures seem to be fused into a single soft mass of dusky red, areolar tissue and blood clot, one needs both the courage and assurance that come from an exact recognition of the extent of the injury.

The prompt healing and the freedom from postoperative wound reaction and discomfort that follow operative procedures when no hematoma formation or wound infection has taken place are nowhere more essential for a successful outcome than in the case of nerve and tendon injuries. A divided nerve must heal with a minimum of fibrous tissue formation if nerve axons are to find their way into the distal segment of the divided nerve. Tendons must again glide back and forth if function is to be restored. The induration and fibrosis that follow extravasation of blood into the soft tissues and that are so pronounced in tissues in which infection has taken place can cause compression of injured nerves that results in interruption of nerve impulses, scar

formation at the site of union of divided nerves that blocks downgrowth of nerve axons and fixation of sutured tendons that makes free gliding movement difficult or impossible. The fibrous tissue formation that could conceivably strengthen the abdominal wall after closure of a hernial opening or reinforce the site of closure of a perforated bowel can make the restoration of function after the repair of nerve and tendon injuries exceedingly difficult or even impossible to accomplish.

How can one be assured of the maximum chance for success in the repair of such an injury? A number of factors must be considered but first in importance is the *time that has elapsed*. One could almost assert categorically that if the injured patient is seen promptly—within a half hour after injury has occurred and if the first aid treatment has been limited to the immediate application of a sterile bandage and a compression dressing it should be possible to convert any lacerated wound without extensive tissue loss into a clean surgical wound that can be repaired and that can be expected to heal by primary union. This possibility diminishes definitely with every half hour that elapses and after three hours one would be unwilling to attempt primary repair of divided nerves and flexor tendons. Lost blood can be replaced by transfusion; there is no compensating substitute for lost time.

Other factors in addition to the time that has elapsed should be thoughtfully considered. The possibility that bacterial contamination has been added to an open wound as a result of overzealous first aid treatment must be kept in mind. More and more, surgeons in industry and men who constantly see patients with compound wounds emphasize the importance of covering the open wound with a sterile dressing at the earliest moment, applying a compression dressing and immobilizing splint,

and avoiding any examination of the wound, any chemical applications or any effort to tie off bleeding vessels as a first aid measure. Simple compression with an elastic bandage or direct manual pressure over a sterile dressing can arrest even arterial bleeding. Rarely is a tourniquet required in first aid treatment; too often it accelerates bleeding instead of arresting it. The late Mont Reid often commented on the frequency with which bleeding from an open wound ceased when the tourniquet was removed and the part elevated.

The circumstances under which the injury was sustained deserve consideration. Clean cut wounds of clean hands, caused by sharp metal or glass and sustained indoors are least likely to be contaminated. At the opposite end of the scale are wounds from more blunt objects sustained out-of-doors, perhaps in a dirty street or in an accident on the farm. Hands and forearms covered with grease and oil are not necessarily infected; one often sees wounds of greasy hands heal kindly even though the grease has thoroughly stained the exposed tissues of the open wound.

It is hardly necessary to add that a well equipped operating room with adequate assistance from anesthetist and house staff is essential in carrying out efficiently what can be a trying and tedious surgical procedure. To attempt to repair divided nerves and tendons in unfavorable surroundings and without sufficient aid almost certainly results in failure.

The difficult emergency operation often imposes a psychological handicap on the surgeon and his assistants. It comes unexpectedly. It thrusts itself like an unwelcome visitor into a well ordered routine. Often it is difficult to postpone planned procedures and give one's undivided attention to the unanticipated problem in which time is of the essence. Here again necessity knows no choice, and the

best interests of the patient will be served if the surgeon can promptly and whole heartedly transfer his attention to the new and unexpected task.

In the operating room the preparation of the wound transformation of the contaminated wound into a clean surgical wound is one of the most important steps in the surgical treatment. Zininger, Hermann, Altmeier and their associates at the Cincinnati General Hospital have performed a splendid service for the medical profession in their excellent motion picture demonstration of how wound cleansing and preparation for repair can and should be carried out. Their demonstration has been seconded and emphasized by an excellent film on the surgical preparation of patients with compound injuries prepared by the Medical Department of the Navy. Insistence on patience, thoroughness, and avoidance of mechanical and chemical trauma emphasizes surgical principles which are everywhere accepted, and which these films illustrate so graphically. If they continue to receive the publicity and attention they deserve the standards of care will be measurably improved wherever surgical work is being done.

When wound cleansing is complete the surgeon must make the final decision as to whether immediate repair should be undertaken. If he is satisfied that the open wound has been transformed into a clean surgical wound and if it can be closed without tension there is every logical reason for immediate suture of divided nerves and tendons. If he is still in doubt it is wise to close the wound without tension and postpone the repair until healing has taken place and inflammatory reaction subsided. Repair and incomplete closure are inconsistent with one another and fail to give satisfactory results. The local use of chemotherapeutic agents favors hemorrhagic exudation and hinders rather than helps the

healing process. Surgeons for the most part agree that sulfonamides and penicillin are of very great value in preventing spreading infection but they cannot safeguard the patient if surgical principles are neglected or ignored. Too many failures in the past have demonstrated that one cannot safely extend the indications for repair and closure of compound injuries because improved chemotherapeutic agents are now available. They constitute an added safeguard but not a substitute for time tested methods.

In the operative procedure two helpful aids are available to simplify the operation. The use of a bloodless field secured with the aid of a blood pressure cuff is an important advantage always available to the surgeon operating upon the extremities. Extension of the wound of injury both above and below by incisions that do not cut across flexion creases permits adequate exposure and enables one to identify injured structures with certainty something which is exceedingly difficult to do if one begins the dissection in the uniformly discolored tissue present at the level of the injury. Gentleness in handling tissues, the use of fine non-absorbable suture material, accurate apposition of divided tendons and nerves, complete hemostasis, protection of the suture line of the divided structures with soft areolar tissue and careful closure of the fascial envelope that surrounds the structures of the forearm, that holds them in place and separates them from overlying subcutaneous tissue and skin—all are simple principles which are accepted by good surgeons everywhere and all are of great importance in achieving a satisfactory result.

The younger surgeon whose experience has been largely with military casualties, and whose surgical decisions have been guided by directives laid down as broad policies, may be perplexed at times in transferring his war ex-

periences to the problems of civilian surgery. The opportunity to see the patient promptly after injury to care for him immediately, to give him as much time as is necessary for meticulous surgical care and to follow him day by day all help to make possible procedures that could not be attempted with safety under the conditions which obtain in military surgery. The surgical skill that has been acquired in handling large numbers of cases can be of inestimable value if it is combined with a realization of the opportunities associated with individualization rather than mass treatment of surgical problems.

Alertness good surgical judgment and the willingness to undertake a difficult surgical task promptly rather than to see the patient in the morning will secure the optimum results for patients with serious nerve and tendon injuries. When one recalls how completely an individual's outlook on life can be changed by such an injury whether the patient is a workman whose livelihood depends on the function of his hand or a youngster with life stretching before him it is not too much to ask that he shall receive the most skillful aid that good surgery can bring to him.

SUMNER L. KOCH



John H. H. H.

837-908

THE BOOK SHELF

CANCER AND POLITICS

The Operation on Grover Cleveland

M G SEELIG M D F A C S St Louis Missouri

EVERY story is set off by its accompanying background. Sometimes this scenery has to be created by literary artifice in other instances, nature or circumstance supplies it. In 1893 one of the most dramatic surgical operations in American history lent color to a period that was packed with sufficient explosive tinder to alarm the best and most patriotic minds of our people. The patient was Grover Cleveland the President of the United States. The operation was the removal of his left upper jaw which was the seat of malignant disease.

Age, overwork, obesity, the attritional effect of his years in office with their influence on prognosis are not insignificant details of background but after all they constitute technical data of purely surgical significance. At the very heart of the concern of those charged with the destiny of our country in 1893 was the fact that in one pan of the balance lay the life of a man and in the other all the elements of an incipient political revolution.

Here is the picture. In November of 1892 Grover Cleveland won his second election for the Presidency of the United States over his opponent Benjamin Harrison and on March 4, 1893, took office. This was a period of exciting unrest due to the heavy exportation of gold by the United States, the suspension of free coinage of silver by India, the lack of confidence in public credit due to the shortage of gold in the treasury of the United States, the fear of a silver basis, the unwise speculation of this era and the problem of general unemployment. These various factors precipitated on June 27, 1893, a devastatingly disastrous panic. One of the first acts of President Cleveland was to call a special session of Congress for August 7, 1893, to repeal, absolutely and uncompromisingly the Sherman Act. The essential goal for driving Congress over partisan hurdles on to this repeal,

was that very "defiant frankness" and blazing indiscretion which were in reality Cleveland's powerful virtues even though construed by his foes as his faults. It was literally on the very eve of this battle that the President developed farcoma of the left superior maxilla.

On June 18, 1893, just 50 days before Congress was to meet in special session, Dr. R. M. O'Reilly, who later became Surgeon General of the United States Army, examined the President and discovered an ulcer of the left side of the hard palate, this lesion was about one and one-half centimeters in diameter, encroaching on the soft palate and the underlying bone. A portion of the lesion was excised for biopsy and was pronounced by the pathologist of the Army Medical Museum (who did not know the name of the patient) to be highly suggestive of malignancy. Dr. Joseph D. Bryant, an intimate friend of the President and a New York surgeon of renown, who was called in at the suggestion of Dr. O'Reilly, advised an immediate operation. The President accepted this counsel without qualification.

From what has already been said regarding the gravity of the economic unrest in the country, it will be appreciated readily that the diseased area in the mouth of President Cleveland, though no larger than a silver quarter, loomed on the horizon in edict proportions. The challenge of surgery had been accepted by the patient, but had the public got word of what was brewing, the consequences would have been unpredictable. Secrecy was therefore the order of the day, and as we shall see later, every circumstance connected with the incident was shrouded from both the members of Congress and the public at large.

Unfortunately, however, one newspaper man, under the by-line of "Holland" (E. J. Edwards), published in the *Philadelphia Press* of August 29, 1893, a report that the President had undergone a serious operation for the removal of some teeth

From the Department of Research of The Barnard Free Skin and Cancer Hospital, St. Louis, Missouri.



Ernest Hemingway

837-908

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M G SEELIG MD F.A.C.S., St. Louis, Missouri

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Unfortunately, however, one newspaper man, under the by-line of Holland (E. J. Edwards), published, in the *Philadelphia Press* of August 29, 1893, a report that the President had undergone a serious operation for the removal of some teeth

and a good deal of the bone from the upper jaw. Many of the details set down by Holland were uncannily correct. But the fact that the President had opened the special session of Congress on August 7th presenting no evidence of scar and in perfect voice tended to discount the report of Holland as more or less of a canard or at best as a gross exaggeration. The Editor of the *Philadelphia Public Ledger* Mr. L. Clarke Davis, a personal friend of Mr. Cleveland, characterized Holland's report as an infamous exploitation of a toothache and a cancer fake. Other newspapers denied that any operation had been performed. And so from the date of operation, July 1, 1893 until Dr. W. W. Keen published an authentic, play by play account of the incident, 24 years later and 9 years after Grover Cleveland's death the general public was kept in ignorance of all the facts in the case.

Before outlining the information detailed in Dr. Keen's account of the operation, the postoperative course, and the measures taken to preserve secrecy it may not be amiss to call attention to the fact that of our 33 Presidents, two have been subjects of malignant disease—Grant and Cleveland. This represents a proportion of approximately one to sixteen—a figure that is strikingly lower than the one in eight that is generally presumed to be the actuarial ratio of cancer incidence. All such figures should be taken with more than a grain of salt as anyone will realize who patiently analyzes the most authentic historic accounts of the lives and deaths of our Presidents: only to discover the difficulties in the way of establishing accurate diagnoses either of the illnesses they endured or the specific causes of death in any but a negligibly small number of them. There is no more warrant for concluding that the Presidency of the United States carries with it a partial immunity to cancer than there would be justification in assuming that the American electorate suffers from a presidential assassination complex, because in the comparatively short period of 81 years, from 1865 to 1946, we have murdered over 18 per cent of our Chief Executives.

As further evidence of the elusive value of statistics, is the fact that of the Presidents who were subjects of cancer 50 per cent recovered. Cleveland was operated upon in 1893 and died fifteen years later of cardio-vascular-renal disease, uncomplicated by anything that resembled either recurrence of the original tumor or metastasis springing from it. His various biographers refer to recurrent attacks of gastrointestinal disease but one finds nothing indicating that these attacks were in any way associated with gastrointestinal malignant disease—primary or metastatic. A

semi-official public statement, signed by his friends, Dr. Joseph D. Bryant, Dr. George R. Lockwood, and Dr. J. M. Carnochan, and published the day of his death stated that "heart failure complicated with pulmonary thrombosis and oedema, were the immediate causes of his death. This statement also reiterates the facts that Mr. Cleveland for many years had suffered from repeated attacks of gastrointestinal disease. Also that he had long standing disease of the heart and kidneys. Despite these seemingly accurate data—a copy of the official death certificate, kindly furnished me by the Department of Vital Statistics of the State of New Jersey records the duration of the President's illness as about one day. A photostatic copy of this death certificate is herewith reproduced.

The final cause of the death of President Cleveland is significant, chiefly in its bearing on the dramatic incident of the operation for the removal of the President's left upper jaw. The pre-existing cardio-vascular-renal disease must have added greatly to the concern of the surgeons. The entire episode created an explosive touch-and-go situation that not only called for the secret restoration of the health of the President, but also demanded every ounce of precaution to avoid serious postoperative complications, and to assure the resumption of his activities by the President within the short period of about six weeks before Congress met in special session. These ends must be accomplished by surgeons working on a subject who was, on any account, a poor surgical risk. It is true that the famous New York internist, Dr. E. G. Janeway after a careful physical examination, issued a clean bill of health reporting normal lungs, good pulse, little if any arteriosclerosis, and almost normal kidneys. But Dr. Keen, in discussing the hazards of anesthesia, remarks that much anxiety was due to the fact that the patient was 56 years old, very corpulent with a short thick neck, in general representing the apoplectic habitus, and harassed almost to the point of physical and nervous exhaustion by the cares of office and in particular by the unrelenting pressure of patronage and office seekers.

These details, together with those set down earlier concerning the unsettled social, economic, and political state of the Nation, furnish us all that is necessary as a background for the fateful operation, which we shall now describe. All the details embraced in this particular part of the recount rest by necessity on one source namely the story published by Dr. W. W. Keen in the *Saturday Evening Post* on the 22nd of September 1917 (page 24) Dr. Keen, a Philadelphian, who was 80

State of New Jersey—Bureau of Vital Statistics
CERTIFICATE AND RECORD OF DEATH.

No. Under of Decedent *Sarah J. Cincin*

Date Death *Sept. 1906*

Place Birth *Cincinnati Ohio*

Age *78*

Sex *Female*

Color *White*

Married *Yes*

Usual Residence *Cincinnati Ohio*

Place of Death *New York City N.Y.*

How long resident in this State *10 yrs*

Name of Person *J. H. Cincin*

Relationship *husband*

County of Birth *Hamilton Ohio*

County of Death *New York N.Y.*

I do hereby certify that I attended the deceased during the last illness, and that he died on the 3rd day of June 1906, and that the cause of death was Heart failure complicated with Thrombus Aneurysm. Length of sickness about one hour.

Signature of Physician *J. H. Cincin*

Signature of Informant *J. H. Cincin*

Place of Burial *Cincinnati Ohio*



This is to certify that the foregoing is a true and correct copy of a record on any office

L. Lyman Webster

[illegible]

Halter & Scott

*State Reproductive and Family
Planning of 2nd Generation*

Method made of 1941

WARNING: DO NOT ACCEPT THIS TRANSCRIPT UNLESS THE RAISED SEAL OF THE STATE BUREAU OF VIT STATISTICS IS AFFIXED THEREON.

Death certificate.

years old when he wrote this article had enjoyed international pre-eminence as a surgeon for many decades. He was therefore, the logical man to serve as Dr Joseph D Bryant's consultant. Dr Bryant had as aids and additional consultants Dr Janeway the Internist, Dr Ferdinand Hasbrouck the dentist and nitrous oxide gas anesthetist Dr R. M O'Reilly ether anesthetist and Dr John Erdmann, who was Dr Bryant's assistant in private practice.

Since it seemed that secrecy could be best preserved by having the operation performed on a boat, it was decided to make use of the yacht "Onida" whose owner Mr. E. C. Benedict of New York, was a devoted and intimate friend of President Cleveland. At different times of the day and night of June 30 1893 carefully avoiding all scrutiny Doctors Janeway O'Reilly Hasbrouck Erd

mann and Keen boarded the yacht lying in New York harbor. That same night, the President with his secretary of war Daniel Lamont and Dr Bryant, boarded the yacht, which had been converted temporarily into an efficient hospital ship. Mr Benedict was also a member of the party.

On the morning of July 1 the yacht proceeded up the East River at half speed while the operation was performed. Under nitrous oxide gas anesthesia Dr Hasbrouck extracted the two upper left bicuspid teeth. Then, after Doctor Bryant had made the necessary incisions in the roof of the mouth ether was substituted for nitrous oxide gas during the rest of the operation throughout which Doctors Keen and Erdmann assisted Doctor Bryant. The entire left upper jaw was removed from the first bicuspid tooth to just beyond the last molar tooth. A small portion of the soft palate

was removed, but the orbital plate was left intact. The antrum was found to be partly filled by a gelatinous mass, grossly sarcomatous in nature and confirmed later to be sarcoma by Dr. William H. Welch, the Professor of Pathology at Johns Hopkins University. The entire operation was done within the mouth, thus avoiding an external scar as visible evidence of the performance of an operation. The skillful use of pressure packs, hot water and the galvanocautery made it possible to complete the operation with the aid of only one ligature. During the course of the operation, which lasted approximately one hour about six ounces of blood was lost. At the completion of the operation, the wound cavity was packed with gauze and the patient was returned to his bed in excellent condition. The postoperative course was uneventful, the patient's temperature never rising higher than 100 degrees F and his pulse averaging 90. Unfortunately, however, speech, "labored but intelligible" while the wound was packed, was wholly unintelligible when the packing was removed, "resembling the worst possible case of cleft palate." This defect was corrected by the New York dentist, Dr. Kasson C. Gibson, who fitted the President with an artificial jaw of vulcanized rubber.

The second day after operation the President was out of bed, and two days after that, the evening of July 5th, the yacht sailed up Buzzards Bay where the patient was transferred by launch to Gray Gables. He walked to his residence with apparent ease. A few days after this, Dr. Bryant, suspicious that a remnant of tumor tissue had escaped removal, requested Doctors Keen, Erdmann and Janeway again to board the Benedict yacht

Oneida where on July 17th, under the same secret precautions as previously all suspicious tissue was excised and the entire surface seared with the galvanocautery. Again the President was up and about on the second postoperative day.

On August 5, 1893, just twenty days after the second operation, President Cleveland arrived in Washington, D. C. in order to direct the strategy of the repeal of the Sherman Law. The law was repealed. It is generally conceded by authorities in the field of history that, had Cleveland's opponents suspected the true state of affairs concerning his physical compromise, the gravity of the consequences would have been unpredictable. Doctor Keen, in his account of the operation remarks that if knowledge of the performance of the operation had leaked out, at the time, we can only surmise and shudder over what the national and political consequences might have been.

Grover Cleveland died fifteen years, lacking a month, after the removal of his jaw. One finds no-

where in literature any credible, specific statement regarding the cause of death. As has already been noted, the death certificate is not satisfactory. There circulated a rumor a short time after Mr. Cleveland died, that his death was due to abdominal cancer. It is impossible to discover whether or not this is true or if true, whether the lesion was an independent primary growth or a metastatic lesion. None of the full length biographies clears up the question. Confronted with this dilemma, even at this late day, I inquired of Mr. Cleveland's widow, Mrs. Frances Folsom Cleveland Preston, who wrote me saying that she regretted her lack of information concerning "the doctors' side of it all." She goes on to say further in her letter that, "I never knew what it was, but it must have been the same deadly enemy internally. The doctors have all gone. No one really knows. I was close to the suffering and distress of mind and body and could be thankful when the relief came."

One participant in the dramatic incident, Dr. John F. Erdmann, who assisted Dr. Bryant is still living in the city of New York, active in the practice of surgery. I wrote him for information, and he has been kind enough to tell me that he knows that Mr. Cleveland died of intestinal obstruction but does not know whether or not the obstruction was due to a malignant growth. Dr. Erdmann feels that if the obstruction were due to a malignant growth, it must have been a second primary tumor because it developed almost fifteen years after the removal of the jaw tumor. Dr. Erdmann further states that he had been told by Dr. Bryant that Dr. Keen was called into service as consultant in order to assume responsibility in part, in the event of a fatality."

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REVIEWS OF NEW BOOKS

THE second edition of Handfield Jones' *Surgery of the Hand* belongs in the library of every man who handles infections or injuries of the hand. It has been developed from a long experience in lecturing on the subject and from the need for expressing clearly and tersely the salient features of hand surgery. The author has been able to set down in minimum space the maximum of information. His approach is anatomic and physiologic; each condition is considered first from the standpoint of the structure of the area concerned from which are derived the directives for therapy. The functional significance of the hand and the various features thereof are constantly kept in the foreground and stressed. The resident and young surgeon entering his surgical practice can receive no better theme for care of wounds and infections of the hand than is given in this book.

With the tendency nowadays to rely on chemotherapeutic and antibiotic agents to compensate for errors in surgical care, the properly sobering influence of Handfield Jones' book in emphasizing principles is thoroughly in order. One cannot express this better than the author who states,

Although in penicillin we have placed in our hands a weapon of great power, let us remember it does not diminish one whit the need of early diagnosis and exact treatment if we are to achieve our real object.

As evidence of the soundness of his teaching it is observed that the section on infections has been increased by five pages by the inclusion of material on the sulfonamides and penicillin. Chapters have been added on amputations and burns, both somewhat stimulated by recent war experiences.

One might differ from the author in some things, particularly in the problem of early resumption of motion in injured and infected hands and in some phases of burn therapy. These differences hinge largely on differing concepts of the significance of rest for injured and inflamed tissues and entirely on the period during which rest should be enforced. On the question of primary tendon repair the reviewer differs somewhat on the indications for primary repair and on the feasibility of repair of tendons within their sheaths. The time limit of 8 hours within which tendon suture may be safe seems a bit too long. Four hours has seemed a safer limit. Under favorable conditions it is possible by proper enlarging incisions to expose and repair nerves and tendons as a primary operation. Repair within the digital sheaths has been shown to be feasible provided it is accomplished within 8 hours after injury provided certain prerequisites obtain and a definite technique is followed.

These criticisms do not detract from the value and significance of this book and the soundness of its

teachings. If followed by every house officer and every general surgeon the level of care of wounds and infections of the hand would be immeasurably raised.

MICHAEL L. MASON

A COMPREHENSIVE survey by Dr. Harold Thomas Hyman of the fields of general medical practice is compressed into four volumes, each of about 1000 pages.¹ These volumes are serviced by a special separately bound index. The work, intended as a complete text for the general practitioner, is divided into five sections: bodily injuries and responses to injury; disturbances of the systems of communication and co-ordination; disturbances of end organ systems; techniques of diagnosis and therapy; and prognosis. The basic material that of internal medicine is very well presented; among other fields covered are convalescence, dentistry, dermatology, emergency surgery, neurology, obstetrics and pediatrics. Incorporated is contributory information furnished by such preclinical sciences as anatomy, bacteriology, pathology, physiology and serology. The subjects of physical diagnosis, laboratory methods, clinical pathology, electrocardiography, pharmacology, and therapeutics are treated. Illustrations are profuse.

To assist in the interpretation of symptoms 310 tables of differential diagnosis by presenting symptoms and signs are included. Integration of the text is accomplished by means of an index which provides references to the separate presentations and to the tables and by means of cross references. It is therefore usually possible after taking a history and examining the patient, and after reference to the proper table, either to make a definite diagnosis or to discover what further procedures are necessary for diagnosis and thereafter to outline a program for the relief or cure of the symptoms which led the patient to seek medical advice.

This ambitious project is an encyclopedia for the general practitioner intended for reference as regards the patient rather than for straight reading. Although it is questionable whether these volumes make superfluous the use of other texts of more limited scope and doubtful whether the aim set forth can ever be completely accomplished, it must be admitted that the work is astonishingly successful. The general practitioner cannot fail to derive benefit and obtain help in his work from its use and study.

WALTER H. NADLER.

IT is impossible in a few paragraphs thoroughly to review the monograph entitled *Further Studies in Encephalography*.² While of modest size (only 104

AS ILLUSTRATED PRACTICE OF MEDICINE: A complete General Practice of Medicine from Differential Diagnosis by Presenting Symptoms to Specific Management of the Patient. Vols. 1, 2, 3, 4. By Harold Thomas Hyman, M.D. Philadelphia and London: W. B. Saunders Co., 1944.
² FURTHER STUDIES IN ENCEPHALOGRAPHY. By E. Osborne Robertson, M.D. F.R.C.P. F.R.A.C.P. Baltimore: Macmillan & Co., Ltd. 1944.

tal Surgical Problems, and surgical film exhibitions. The Friday afternoon program will include the Assembly of Initiates clinics in the hospitals and six concurrent panel discussions on respectively obstetrics, plastic surgery, neurological surgery, thoracic surgery, urology and orthopedic surgery. The concluding event of the Clinical Congress program will be the Convocation on Friday evening at 8:15 o'clock in the Grand Ballroom.

Detailed programs are listed in succeeding pages.

CLINICAL PROGRAM

The hospitals and medical schools of greater New York are co-operating in scheduling operative and nonoperative clinics, and group clinical conferences. Visiting surgeons will have excellent opportunities to attend well arranged programs of many different kinds in selected hospitals in the area. General and special demonstrations will be held on such subjects as fractures, cancer, maternal morbidity and end-result studies, clinicopathologic and x-ray conferences, newer diagnostic and therapeutic procedures, preoperative and postoperative supportive treatment, anesthesia, reconditioning and many other timely subjects. Good opportunities for studying the newer techniques and surgical procedures will be provided.

The program of each general hospital will be arranged to cover subjects in general surgery, obstetrics and gynecology, fractures, orthopedic surgery, thoracic surgery, neurosurgery, genitourinary surgery, ophthalmology, and otolaryngology.

The list of hospitals which are participating in the clinical program with the names of the hospital representatives, follows:

New York

Beckman-Downtown Hospital—Robert H. Kennedy
Bellevue Hospital

First Division—Robert Wyke

Second Division—Ernest Lampe

Third Division—W. B. Murphy

Fourth Division—Vansel Johnson

Beth Israel Hospital—Samuel Standard

Flower and Fifth Avenue Hospitals—S. T. Glasser

Golda ter Memorial Hospital—Conduct Cutler

Harlem Hospital—David Smith

Harlem Eye and Ear Hospital—C. B. Meding

Hospital for Joint Diseases—A. J. Beller

Hospital for Special Surgery—T. C. Thompson

Lenox Hill Hospital—Otto Pickhardt

Manhattan Eye, Ear and Throat Hospital—Frank Kell and

Joseph D. Kelly

Memorial Hospital for the Treatment of Cancer and Allied

Diseases—Allen O. Whipple

Metropolitan Hospital—Kenneth C. Peacock

Montefiore Hospital for Chronic Diseases and Country

Sanatorium—Arthur H. Aufses

Mt. Sinai Hospital—Ralph Colp

New York Hospital—S. W. Moore

Lying-in Hospital—Gordon Douglas

New York Eye and Ear Infirmary—Stuart L. Craig

New York Orthopedic Dispensary and Hospital—Hafford
Haddock

New York Post-Graduate Medical School and Hospital—
R. F. Carter

Presbyterian Hospital

Babies Hospital—Thomas V. Santoli

Neurological Institute—John Scadd

Presbyterian Hospital—John Scadd

Sloane Hospital for Women—Charles Lee Burton

Institute of Ophthalmology—Arthur G. DeVoe

Section on Otolaryngology—James W. Babcock

Squier Urological Clinic—Charles T. Howard

Presbyterian-New York Orthopedic—Harrison L. Mc

Laughlin

Roosevelt Hospital—James E. Thompson

St. Luke's Hospital—Paul C. Morton

St. Vincent's Hospital—Raymond P. Sullivan

U. S. Marine Hospital—Homer L. Skinner

Veterans Administration Hospital—Paul K. Sauer

Woman's Hospital—Ralph L. Barrett

Brooklyn

Brooklyn Eye and Ear Hospital—M. A. Lasky

Cumberland Hospital—Herbert Wilks

Home of St. Giles, The Cripple—C. C. Vitale

Jewish Hospital—Louis Berger

Kings County Hospital—Joseph Tenopir

Long Island College Division—Philip Lear

Long Island College Hospital—Albert Ritzman

Methodist Hospital—P. A. Renaud

St. Job's Hospital—Merrill N. Foot

HOSPITAL STANDARDIZATION CONFERENCE

The first formal session of the Clinical Congress will be the opening meeting of the twenty-sixth Hospital Standardization Conference. Dr. Irvn Abell of Louisville, President of the American College of Surgeons, will preside. The hospital conferences will continue on Monday afternoon, with sessions following on Tuesday, Wednesday and Thursday mornings, afternoons and evenings.

Hospital administrators, members of governing boards, medical staff members, heads of the various hospital departments and their personnel, nurses, dietitians, medical records librarians, and many other persons directly concerned about hospital progress, will be interested in the discussions of current hospital problems.

The Monday afternoon session will be devoted to a panel discussion on current problems in medical service in hospitals. Tuesday morning to improvement in food service in hospitals. Tuesday afternoon to improvement in nursing service in hospitals. Tuesday evening to a joint session for hospital trustees, medical staff officers, and administrators. Wednesday morning to discussion of personnel and public relations. Wednesday afternoon to a joint session with the American Association of Medical Record Librarians on improving medical records. Wednesday evening to a

PRELIMINARY PROGRAM—1947 CLINICAL CONGRESS

on trends in hospital administration and al hospital problems Thursday morning to a on special problems Thursday afternoon to a ad table conference on problems of the small ital in meeting the standards of the American lege of Surgeons and to a symposium on Grad e Training in Surgery and Thursday evening a special conference on the point rating system. Detailed programs appear on succeeding pages.

ANNUAL MEETING

The annual meeting of the Governors and Fel ws will be held on Thursday afternoon at 1:45 There will be election of officers and governors. The annual meeting affords the Fellows of the College an opportunity to hear reports of officials on the work of the organization and to broaden their knowledge of the methods, and their effect iveness, which are used to raise the professional and ethical standards of surgery and to promote good hospital care and general improvement in the practice of medicine. Each Fellow has a per sonal part in this work and may extend the influ ence of the College materially in his local com munity and wherever his contacts extend. Hos pital Standardization particularly offers him wide opportunity to provide better medical care for patients in the hospital in which he works through continuous progress in applying the principles of the Minimum Standard which insure the best care of the patient.

Every Fellow will be interested in the reports which will be presented on the following subjects finances Hospital Standardization Graduate Training in Surgery Medical Motion Pictures Publications Public Relations Library and Lat erary Research the work of the state and provin cial credentials committees committees on appli cant, and the Committee on History Reviews Sectional Meetings, 1947 and the Department of Clinical Research including cancer clinics and cancer detection centers, the Committee on Can cer Medical Service in Industry and the Com mittee on Fractures and other Traumas. Dr Abell, Chairman of the Board of Regents, will re port on administration of the College and Dr Arthur W. Allen will discuss the obligations and opportunities of the Fellows.

MEDICAL MOTION PICTURES

The latest available films demonstrating surgi cal procedures and related subjects will be shown in the medical motion picture exhibits which will be held daily in The Waldorf Astoria. Motion pic tures are a much appreciated feature of the Clin ical Congress. Many new pictures on varied sub

jects are being received by the American College of Surgeons for review. Both sound and silent colored films will be shown during the Congress all of which will have been approved by the Com mittee on Medical Motion Pictures.

There will also be shown the first of a series of films which are being produced by the College under a grant from the Johnson & Johnson Re search Foundation. The film is entitled "Anoma lies of the Bile Ducts and Blood Vessels. Structures of the Common Duct," a teaching film of which Dr. Warren H. Cole of Chicago is the author. It is contemplated that there will also be completed in advance of the Clinical Congress at least one additional film which is being produced by the College under the expanded program.

ADVANCE REGISTRATION

The hospitals and medical schools of New York afford accommodations for a large number of visiting surgeons. However, in order to insure against overcrowding attendance at the Congress will be limited to the number that can be accom modated at the clinics and meetings. It is there fore expected that surgeons who wish to attend the Congress will register in advance.

Because of greatly increased costs and expenses to which the College will be subjected this year in connection with its New York Clinical Congress the Board of Regents has found it necessary to require a registration fee of \$5.00 for Fellows and for endorsed Junior Candidates. Non Fellows attending as invited guests of the College will pay a fee of \$10.00. No fee will be required of initiates of the class of 1947.

The registration desk will be open from 3:00 to 9:00 p.m. on Sunday, September 7, in order to permit surgeons to obtain tickets for the Monday clinics. A new plan is to be adopted in New York of distributing clinic tickets on the day prior to the clinics, from 9:00 a.m. to 5 p.m. Any remain ing tickets will be available at 7:00 a.m. the same day on which the clinics are held.

TECHNICAL AND SCIENTIFIC EXHIBITION

The technical exhibit, together with the registra tion and clinic ticket bureaus, will be located in the Basilidon Room, Jade Room, and Astor Gallery all on the third floor of the hotel. Leading manufacturers of surgical instruments, x-ray apparatus, sterilizers, operating room lights, ligatures, dressings, hospital apparatus and supplies of all kinds, and pharmaceuticals and publishers of medical books will be represented. The techni cal exhibits will demonstrate many of the new features learned from our experience in the war.

GENERAL ASSEMBLY

JOINT SESSION—SURGEONS AND HOSPITAL REPRESENTATIVES

Monday 10.00 a.m.—12 30 p.m.—Grand Ballroom—The Waldorf Astoria

IRVIN ABELL, M.D., Louisville President American College of Surgeons, Presiding.
 Welcome from the Mayor and the Hospitals of New York. EDWARD M. BERNHEIMER, M.D. New York, Commissioner Department of Hospitals, City of New York.
 Greetings from the American Hospital Association. JOHN H. HAYES, New York President.
 Greetings from the Canadian Hospital Council. HARVEY AGNEW, M.D. Toronto, Secretary.
 Summary of College Activities as Related to Hospitals for Past Year. IRVIN ABELL, M.D. Chairman, Board of Regents.
 Need for Efficient Medical Staff Organization and Control of the Professional Work of the Hospital. HAROLD L. FOSS, Danville, Pennsylvania, Surgeon in Chief, Gelsinger Memorial Hospital.
 Better Hospital Facilities for Rural Patients—Plans to Integrate Small General Hospitals with Nearest Institutions Incorporating Specialized Services. GRAHAM L. DAVIS, Battle Creek Hospital Director.
 W. K. Kellogg Foundation, President Elect American Hospital Association.
 The New Era in Personnel Relations and its Meaning for Hospitals. BRIGADIER GENERAL ROBERT W. JOHNSON, New Brunswick, Chairman, Board of Trustees, Johnson & Johnson.
 The Potentialities of the Medical Motion Picture for Teaching Purposes. WARREN H. COLE, M.D., Chicago, Professor of Surgery and Head of the Department of Medicine, University of Illinois College of Medicine in collaboration with TOM JONES, Chicago, Professor Medical Illustration, University of Illinois College of Medicine.
 Showing: Anomalies of the Bile Ducts and Blood Vessels. Strictures of the Common Duct."

PRESIDENTIAL MEETING

Monday 8 15 10 30 p.m.—Grand Ballroom The Waldorf Astoria

IRVIN ABELL, M.D. Louisville President American College of Surgeons, Presiding.
 Processional—Officers, Regents and Distinguished Guests.
 Address of Welcome. HOWARD A. PATTERSON, M.D. New York, Chairman, Committee on Arrangements.
 Introduction of Distinguished Guests. ARTHUR W. ALLEN, M.D. Boston, Vice Chairman, Board of Regents.
 Address of the Retiring President. The Spirit of Surgery. IRVIN ABELL, M.D. Louisville.
 Inauguration of Officers.
 Presented by LELAND S. MCKITTRICK, M.D. Boston, Retiring First Vice President.
 President. ARTHUR W. ALLEN, M.D. Boston.
 First Vice President. THOMAS E. JONES, M.D. Cleveland.
 Second Vice President. GORDON B. NEW, M.D. Rochester, Minnesota.
 The Second Martin Memorial Lecture. The Qualifications of the Surgeon and the Cancer Problem. ALLEN O. WHITFIELD, M.D. D.Sc. New York, Clinical Director, Memorial Hospital, Emeritus, Valentine Mott.
 Professor of Surgery, Columbia University College of Physicians and Surgeons.
 Recessional.

CONVOCATION

Friday 8 15-10.30 p.m.—Grand Ballroom The Waldorf Astoria

ARTHUR W. ALLEN, M.D. Boston, President, American College of Surgeons, Presiding.
 Processional. Initiates, Officers, Regents, and Distinguished Guests.
 Presentation of Initiates for Fellowship. IRVIN ABELL, M.D. Louisville, Chairman, Board of Regents.
 Fellowship Pledge. Recital by Initiates.
 Conferring of Fellowships by the President. ARTHUR W. ALLEN, M.D. Boston.
 Conferring of Honorary Fellowships. The President.
 Fellowship Address. Liberal Medical Education. ANDREW C. IVY, M.D. Chicago, Vice President, University of Illinois, in charge of Chicago Professional Colleges, and Distinguished Professor of Physiology.
 Recessional.
 Reception by the Officers and Regents for the Initiates and Fellows.

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ASSEMBLY OF INITIATES

Friday 1 45-3.00 p.m.

IRVIN ABELL, M.D., Louisville Chairman of the Board of Regents Presiding
The Program of the American College of Surgeons Hospital Standardization Sectional Meetings, Medical Motion Pictures, Library and Literary Research, Graduate Training in Surgery MALCOLM T. MAC
EACHERN, M.D., Chicago Associate Director and Chairman of the Administrative Board
Fellowship in the American College of Surgeons. IRVIN ABELL, M.D., Louisville
The Department of Clinical Research of the American College of Surgeons. CHARLES R. BRANCH, M.D.
Chicago Assistant Director
Qualifications for Fellowship H. P. SAUNDERS, M.D., Chicago Assistant Director

EVENING SCIENTIFIC SESSIONS

GENERAL SURGERY

Tuesday 8 00-10 30 p.m.

Symposium on The Proper Use of Blood and Blood Plasma
A Permanent Red Cross Transfusion Service G. FOARD MCGINNIS, M.D. Washington.
Blood Bank Organization. PAUL I. HOKWORTH, M.D. Cincinnati
Reactions to Blood Transfusion and the Rh Factor LOUIS K. DIAMOND, M.D., Boston.
The Use of Blood and Plasma in Surgery DALLAS B. PHEMISTER, M.D. Chicago

Wednesday 8 00-10 30 p.m.

Fracture Oration. FRANK D. DICKSON, M.D., Kansas City

Symposium on Nutritional Requirements in Surgery

Proper Employment of Oral Feeding EVERETT I. EVANS, M.D., Richmond.
Parenteral Feeding ROBERT ELMAN, M.D., St. Louis.
The Importance of Adequate Supply of Blood and Nourishment for Wound Healing S. CLAMP LYONS,
M.D. New Orleans.

Thursday 8 00-10 30 p.m.

Symposium on Hypertension

Fundamental Physiological Considerations PETER HEDENBECKER, M.D. St. Louis.
Indications for Surgery in the Treatment of Hypertension. THOMAS FREDLEY, M.D. New Orleans.
Surgical Procedures in the Treatment of Hypertension. ROBTNOLD H. SMITHWICK, M.D. Boston.
End Results in the Treatment of Hypertension. CYRUS C. STURGIS, M.D. Ann Arbor

OPHTHALMOLOGY

Tuesday 8 00-10 30 p.m.

Epithelial Downgrowth Following Cataract Operation. MILTON L. BERLINER, M.D. New York.
Local Anesthesia in Ophthalmology WALTER S. ATKINSON, M.D. Watertown New York.
Operative Treatment of Vertical Tropia BRITAIN F. PAYNE, M.D. New York.
Prevention and Management of Operative Complications During Cataract Extraction JACK S. GUYTON
M.D., Baltimore.

Thursday 8 00-10 30 p.m.

Prevention of Infection in Eye Surgery M. HAYWARD POST, M.D., St. Louis
Glaucoma Following Cataract Extraction. WILLIAM C. OWENS, M.D. Baltimore.
Retinal Detachment. HARVEY E. THORPE, M.D. Pittsburgh
The Difficult Cataract Extraction. R. TOWNLEY PATON, M.D. New York.

OTORHINOLARYNGOLOGY

Tuesday 8 00-10 00 p.m.

Symposium on Bronchiectasis

Relationship of Bronchiectasis to Sinusitis. ROBERT L. GOODALE, M.D. Boston.
The Surgical Aspects of Bronchiectasis. ALTON OCHNER, M.D. New Orleans.
The Use of Bronchoscopy in Bronchiectasis. FLETCHER D. WOODWARD, M.D. Charlottesville.

Thursday 8:00-10:30 p.m.

Symposium on Management of Carcinoma of the Larynx

Treatment by Laryngofissure. CHEVALIER L. JACKSON M.D. Philadelphia.

Laryngectomy. LOUIS H. CLIFF M.D. Philadelphia.

Management of Carcinoma of the Larynx with Metastatic Involvement of the Neck. HENRY B. OSTON, M.D. Newark.

COMBINED SESSION ON OPHTHALMOLOGY-OTORHINOLARYNGOLOGY

Wednesday 8:00-10:30 p.m.

Blood Supply of Eye and Sinuses. OSCAR V. BATSON M.D. Philadelphia.

Dacryocystorhinostomy. HAROLD GIFFORD, Jr. M.D. Omaha.

Relation of the Nasal Accessory Sinuses to Eye Diseases. EDWARD A. LOOPER, M.D. Baltimore.

Ophthalmoneurologic Symptoms of Nasopharyngeal Tumors. FRANK B. WALSH M.D. Baltimore.

FORUM ON FUNDAMENTAL SURGICAL PROBLEMS

Tuesday through Friday 8:30 a.m. to 12:30 p.m. - The Waldorf Astoria

Presentation of the results of clinical and experimental research on problems related to general surgery and the surgical specialties which are being currently conducted in many medical schools, clinics, and hospitals.

Tuesday September 9 8:30 a.m. 12:30 p.m.

Gastric Surgery. Grand Ballroom

Wound Healing. Plastic Surgery and Infections. Serf Room

Wednesday September 10 8:30 a.m. 12:30 p.m.

Surgery of the Small and Large Bowel. Grand Ballroom

Protein, Fluid and Electrolyte Balance. Serf Room

Thursday September 11 8:30 a.m. - 12:30 p.m.

Gall bladder, Pancreas and Peritoneum. Grand Ballroom

Surgery of the Heart and Blood Vessels. Hedgewood Room

Friday September 12 8:30 a.m. 12:30 p.m.

Thoracic Surgery. Anesthesia and Thyroid. Grand Ballroom

Neurosurgery. Tumors, and Urology. Serf Room

SYMPOSIUM ON CANCER CLINICS AND CANCER DETECTION CENTERS

Tuesday 3:00-5:00 p.m.

GRANTLEY W. TAYLOR M.D. Boston. Chairman. Cancer Committee. American College of Surgeons, presiding.

Early Diagnosis of Carcinoma of Stomach. FORDYCE B. ST. JOHN M.D. PAUL C. SWENSON M.D. HAROLD D. HARVEY M.D. New York.

Experience with the Chicago Cancer Detection Center. AUGUSTA WEBSTER, M.D. Chicago.

The U.S.P.H.S. Cancer Control Program. AUSTIN V. DIEBERT M.D. Bethesda.

Utilization of Cancer Clinics for Teaching Purposes

For Undergraduates and Interns in a University Clinic. MAX TAFFEL, M.D. New Haven.

For Members of the Hospital Staff in a Clinic Not Affiliated with a University. WILLIAM R. LAIRD M.D. Montgomery West Virginia.

Utilization of Cancer Records from Clinics and Hospitals. FRANK E. ADAIR, M.D. New York.

SYMPOSIUM ON CANCER

Wednesday 3:00-5:00 p.m.

GRANTLEY W. TAYLOR M.D. Boston. Chairman. Cancer Committee. American College of Surgeons, Presiding.

Surgical Treatment of Carcinoma of the Lung. MICHAEL E. DEBAKEY M.D. New Orleans.

Tumors of the Testis. ROBERT A. MOORE M.D. St. Louis.

Biological Differentiation of Benign and Malignant Tumors. HARRY S. N. GREENE, M.D. New Haven.

Isotopes in Surgical Research. FRANCIS D. MOORE M.D. Boston.

Prognosis in Carcinoma of the Bowel. R. KENNEDY GILCHRIST M.D. Chicago.

Anterior Resection of Carcinoma of the Colon and Rectum. OWEN H. WANGENSTEIN M.D. Minneapolis.

PANEL DISCUSSIONS

GENERAL SURGERY

Monday 1:30-3:00 p.m.

Surgery of Pulmonary Infections

Moderator EVARTS A. GRAHAM, M.D., St. Louis.

Collaborators BRIAN B. BLADES, M.D. Washington RICHARD H. OVERHOLT, M.D. Brookline Massachusetts HAROLD NEUFOR, M.D. New York.

Monday 3:30-5:00 p.m.

Pancreatitis

Moderator MIMS GAGE, M.D. New Orleans.

Collaborators JOHN M. VAUGHN, M.D. Rochester Minnesota HORACE J. MCCORMICK, M.D., San Francisco.

Tuesday 1:30-3:00 p.m.

Surgery of the Spleen

Moderator ALLEN O. WHIFFLE, M.D., New York.

Collaborators GEORGE M. CURTIS, M.D. Columbus ARTHUR H. BLAKEMORE, M.D. New York ROBERT H. E. ELLIOTT, M.D. New York LOUIS M. ROUSSELOT, M.D. New York.

Tuesday 3:30-5:00 p.m.

Jaundice

Moderator CHARLES B. PUESTOW, M.D. Chicago.

Collaborators I. S. RAVDIN, M.D. Philadelphia JAMES T. PRIESTLY, M.D., Rochester Minnesota ROSCOE R. GRAHAM, M.D. Toronto.

Wednesday 1:30-3:00 p.m.

Gastric Surgery

Moderator HOWARD K. GRAY, M.D., Rochester Minnesota.

Collaborators GEORGE T. PAGE, M.D. New York WARREN H. COLE, M.D., Chicago LELAND S. MCKITTRICK, M.D. Boston.

Wednesday 3:30-5:00 p.m.

Use of Antibiotic Agents and Chemotherapy in Surgery

Moderator JOHN S. LOCKWOOD, M.D., New York.

Collaborators FRANK L. MILENEY, M.D., New York C. PHILLIP MILLER, M.D. Chicago, HAROLD A. ZINTEL, M.D., Philadelphia MAJOR EDWIN J. POLASKI, M.C., Fort Sam Houston, Texas.

Thursday 3:30-5:00 p.m.

Surgery of the Hand

Moderator HENRY C. MARBLE, M.D., Boston.

Collaborators HARVEY S. ALLEN, M.D., Chicago LAURIE H. MCKIM, M.D. Montreal J. HAROLD COUCH, M.D. Toronto.

UROLOGY

Friday 1:30-4:30 p.m.

Moderator CHARLES C. HIGGINS, M.D. Cleveland.

Treatment of Carcinoma of the Bladder

Collaborators HUGH J. JEWETT, M.D. Baltimore ARCHIE L. DEAN, M.D. New York EDWARD N. COOK, M.D. Rochester Minnesota.

Management of Renal Lithiasis

Collaborators GEORGE F. CAHILL, M.D. New York LINWOOD D. KEYSER, M.D. Roanoke RICHARD W. SATTERTHWAITE, M.D. Battle Creek.

ORTHOPEDIC SURGERY

Moderator PAUL B. MAGNUSON, M.D. Washington.

Problem of Fractures of the Neck of the Femur

Collaborators KELLOGG SPEED, M.D. Chicago RUDOLPH S. REICH, M.D. Cleveland PAUL C. COLOVA, M.D. Philadelphia.

Indications and Operative Technique for Lumbosacral Fusion of the Spine

Collaborators GUY A. CALDWELL, M.D. New Orleans DAVID M. BOSWORTH, M.D. New York MARK B. COVENTRY, M.D. Rochester Minnesota.

GYNECOLOGY AND OBSTETRICS

Moderator J. MASON HUNDLEY, JR. M.D. Baltimore

Changes in the Urinary System Engendered by Gynecological and Obstetrical Conditions

Collaborators HOUSTON SPENCER EVERETT M.D. Baltimore WILLIAM E. STUDDIFORD JR. M.D.

New York R. GORDON DOUGLAS M.D., New York.

Modern Trends in the Treatment of Malignancies of the Female Genitalia

Collaborators NELSON B. SACKETT M.D. New York ROBERT A. ROSS, M.D. Durham, William P. HEALY M.D. New York.

NEUROLOGICAL SURGERY

Late Results of Compound Craniocerebral Injuries

Moderator A. EARL WALKER M.D. Chicago.

Collaborators JAMES C. WHITE M.D. Boston CORN. PILCHER, M.D. Nashville MICHAEL SCOTT M.D. Philadelphia.

Surgical Aspects of Vascular Disorders of the Brain

Moderator JAMES L. POPPEN M.D. Boston.

Collaborators WALLACE B. HANBY, M.D. Buffalo WINCHELL MCK. CRAIG, M.D. Rochester W. JAMES GARDNER, M.D. Cleveland

THORACIC SURGERY

Moderator STUART W. HARRINGTON M.D. Rochester Minnesota.

Surgery of the Esophagus

Collaborators HERMAN J. MOERSCH M.D. Rochester Minnesota RICHARD H. SWEET M.D. Boston CARL EGGER, M.D., New York ORVAR SWENSON M.D. Boston.

Tumors of the Lung: Benign and Malignant

Collaborators (Same as above)

PLASTIC SURGERY

Moderator WILLIAM G. HANCK M.D. Atlanta.

Repair of Surface Defects of the Extremities

Collaborators TRUMAN G. BLOCKER JR. M.D. Galveston FRANK McDOWELL, M.D. St. Louis W. BRANDON MACOMBER M.D. Albany

Major Facial Defects

Collaborators BRADFORD CAMMOM M.D. Boston W. BOWDOEN DAVIS, M.D. Baltimore CARL E. LINCHER M.D. St. Louis MAJOR ANDREW M. MOORE, M.C. Phoenixville.

OPHTHALMOLOGY

Tuesday 9:00-10:30 a.m.

Surgery of Extracocular Muscles

Moderator HAROLD W. BROWN M.D., New York.

Collaborators RUDOLF AXELI M.D. New York WALTER H. FINK, M.D. Minneapolis RICHARD G. SCHERER, St. Louis.

Wednesday 9:00-10:30 a.m.

Surgery of Glaucoma

Moderator C. S. O'BRIEN M.D. Iowa City

Collaborators P. ROSS McDONALD, M.D. Philadelphia JOHN S. MCGAVIC, M.D., Bryn Mawr WILLIS S. KNIGHTON M.D. New York.

Thursday 9:00-10:30 a.m.

Angiospastic Ocular Lesions

Moderator FRANK D. CARROLL, M.D. New York.

Collaborators WALTER F. DUGGAN, M.D. Utica HERMAN ELWYN M.D. New York HENRY P. WAGENER, M.D. Rochester Minnesota.

OTORHINOLARYNGOLOGY

Tuesday 10:45 a.m.-12:15 p.m.

The Use of Antibiotics in Ear, Nose and Throat Surgery

Moderator CHESTER S. KEEFER M.D., Boston.

Collaborators WESTLEY M. HUNT M.D. New York FREDERICK T. HILL, M.D. Waterville, Maine LEIGHTON F. JOHNSON M.D. Boston.

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Rehabilitation of the Larynx in Bilateral Adductor Paralysis of the Vocal Cords
 Moderator GABRIEL TUCKER, M.D. Philadelphia.
 Collaborators DEGRAAF WOODMAN M.D. New York BRIEN T KING M.D., Seattle ALBERT C
 FURSTENBERG M.D., Ann Arbor

Anesthesia for Ear Nose and Throat Surgery
 Moderator LLOYD H MOUSEL, M.D., Washington.
 Collaborators CARL H. MCCASKEY M.D. Indianapolis, PETER N PASTORE M.D. Richmond
 CURTIS B HICKCOX M.D. Philadelphia PERRY P VOLPITTO M.D. Augusta.

SYMPOSIUM ON FRACTURES AND OTHER TRAUMAS

Tuesday 2:00-5:00 p.m.
 ROBERT H KENNEDY, M.D., New York Chairman Committee on Fractures and Other Traumas Presiding
Appraisal of Present Methods of Treatment
 Intracapsular Fractures of the Neck of the Femur PAUL C COLOVNA, M.D., Philadelphia Professor
 of Orthopedic Surgery University of Pennsylvania School of Medicine
 Fractures of the Upper Extremity of the Tibia Involving the Knee Joint. EDWIN F CAVE, M.D.
 Boston Instructor in Orthopedic Surgery Harvard Medical School.
 Heavy Resistance Exercise in Orthopaedics. THOMAS L DELORME Jr. M.D. Boston.
 Injuries of the Intervertebral Disc. FRANK H. MAYFIELD M.D. Cincinnati Assistant in Clinical Sur-
 gery University of Cincinnati College of Medicine.
 Fractures of the Os Calcis JAMES J CALLAHAN M.D. Chicago Professor Bone and Joint Surgery
 Loyola University School of Medicine.
 Bone Plates and Screws. ROBERT H KENNEDY M.D. New York, Clinical Professor of Surgery New
 York University College of Medicine (Postgraduate Division)

SYMPOSIUM ON GRADUATE TRAINING IN SURGERY AND THE SURGICAL SPECIALTIES

Thursday 3:30-5:30 p.m.
 DALLAS B PREMISTER M.D. Chicago Chairman Committee on Graduate Training in Surgery Ameri-
 can College of Surgeons Presiding
 Centralized Plan of Graduate Training in Surgery MAX M ZIMMERMAN M.D. Cincinnati Associate Pro-
 fessor of Surgery University of Cincinnati College of Medicine
 Graduate Training from the Standpoint of Decentralized Residency Training in Hospitals Affiliated with
 a Medical School ALBERT C. FURSTENBERG M.D. Ann Arbor Professor of Otolaryngology Chairman
 of the Department of Otolaryngology and Dean of the University of Michigan Medical School.
 The Place of the Organized Clinic in Graduate Training in Surgery RICHARD B CATTELL, M.D. Boston
 Surgeon Lahey Clinic.
 Graduate Training in General Surgery and the Surgical Specialties in a Veterans Hospital CHARLES B
 PUESTOW M.D. Chicago Clinical Professor of Surgery University of Illinois Deputy Chief of Sur-
 gery Veterans Administration Hospital Hines
 Discussion Opened by FREDERICK A. COLLIER, M.D. Ann Arbor Professor of Surgery, Chairman of the
 Department of Surgery University of Michigan Medical School Chairman Committee on Relations
 American College of Surgeons with the American Boards and FRASER B GURD M.D. Montreal
 Professor of Surgery McGill University Faculty of Medicine

HOSPITAL STANDARDIZATION CONFERENCE

GENERAL ASSEMBLY JOINT SESSION—SURGEONS AND
HOSPITAL REPRESENTATIVES

Monday 10:00 a.m.—12:30 p.m. (See program on preceding pages.)

CURRENT PROBLEMS IN MEDICAL SERVICE IN HOSPITALS

Monday 2:00—5:00 p.m.—Sert Room—

First Floor—The Waldorf Astoria

Conducted by JOSEPH TURNER, M.D., New York, Director Mount Sinai Hospital.

Integration of the General Practitioner in the Hospital Medical Staff Organization. HARRY R. MCKENNA, M.D., Cincinnati, President, The Society of General Physicians.

The Professional Audit to Control Efficiency. FREDERICK T. HILL, M.D. W.erville, Maine; Medical Director Thayer Hospital.

What is Major and Minor Surgery? Who Should be Permitted to do Major Surgery in an Approved Hospital? J. J. GOWEN, M.D. New York, Director Hospital for Joint Diseases.

Medical Staff Conferences Essential to Medical Progress and Good Care of the Patient. JOSEPH C. DOWNS, M.D., Philadelphia, Medical Director Jewish Hospital and Professor of Clinical Medicine, Temple University Medical School. Professor of Medicine, Graduate School of Medicine, University of Pennsylvania.

Round Table Conference on Medical Staff Problems. Moderator: EVERETT W. JONES, Chicago; Vice President, Modern Hospital Publishing Company.

3:00—10:30 p.m.—Ballroom—Fourth Floor—
The Waldorf Astoria
Presidential Meeting

Hospital representatives attending the Twenty-Sixth Annual Hospital Standardization Conference are most cordially invited to attend the Presidential Meeting.

IMPROVING FOOD SERVICE IN HOSPITALS

Tuesday 9:30 a.m.—12:30 p.m.—Grand Ballroom—
Held Commodore

Conducted by MARGARET GILLAM, Chicago, Dietary Consultant, American Hospital Association.

New Developments in the Field of Nutrition and How They Affect Food Service and the Care of the Surgical Patient. ROBERT ELMAN, M.D. St. Louis, Professor of Clinical Surgery, Washington University School of Medicine.

New Equipment and Methods to Relieve Problems of Food Service Conducive to Complaints and Dissatisfaction on the Part of the Patient. EVERETT W. JONES, Chi-

cago, Vice-President, The Modern Hospital Publishing Company.

The Importance of Good Interdepartmental Relations of the Dietary Department and How They can be Improved. ARTHUR W. ECKERT, Neptune, New Jersey, Administrator, Flitkin Memorial Hospital.

Personnel Problems in the Dietary Department. E. ALLEN MOSSO, New York, Chief Dietitian, St. Luke's Hospital.

Food Service an Important Factor in Personnel and Public Relations. PAUL H. FISLER, Oklahoma City, Administrator, University of Oklahoma Hospitals.

Question and Answer Period.

Problems of Food Service in Hospitals.

IMPROVING NURSING SERVICE IN HOSPITALS

Tuesday 2:00—5:00 p.m.—Sert Room—

First Floor—The Waldorf Astoria

Conducted by CLAUDE W. MUMFORD, M.D. New York; Director, St. Luke's Hospital and Professor of Hospital Administration, Columbia University.

Report of Survey Made by American College of Surgeons on Use of Auxiliary Workers in Nursing Service. HOWARD C. NAFFZIGER, M.D., San Francisco, Professor of Surgery, University of California Medical School, Surgeon-in-Chief, University Hospital.

Utilization and Training of Practical Nurses and Auxiliary Workers. ELEANORE C. PHILLIPS, R.N. Rochester

New York, Executive Director, Visiting Nurse Association, Chairman, Joint Committee on Auxiliary Nursing Service.

How Hospitals Can Help in Student and Practical Nurse Recruitment. EMILY K. JOHNSON, New York, Public Relations Associate, Nursing Information Bureau, American Nurses Association.

Correlation of the Services of the Graduate Nurse, the Practical Nurse, and the Nurses' Aide. LOUIS M. BERENSON, M.D. New York, Commissioner, Department of Hospitals, New York.

Discussion—Questions and Answers conducted by CLAUDE W. MUMFORD, M.D. Chairman.

PRELIMINARY PROGRAM—1947 CLINICAL CONGRESS JOINT SESSION FOR HOSPITAL TRUSTEES MEDICAL STAFF OFFICERS AND ADMINISTRATORS

Tuesday 8:00-10:30 p.m.—Seri Room—
First Floor—The Waldorf Astoria

RAYMOND P. SLOAN, New York Editor The Modern Hospital, Presiding
Hospitals Need Leadership. RAYMOND P. SLOAN, New York
Working Together—Hospital Trustees, Members of the Medical Staff and the Administrator Must Co-operate in Assuring Good Care of the Patient in the Hospital.

JOHN H. HAYES, New York Superintendent, Lenox Hill Hospital, President, American Hospital Association.
Regionalization of Hospitals. EDWARD J. NOBLE, New York, Chairman of the Board, American Broadcasting Company, and Chairman, Life Savers Corporation
A New Era in the Education and Training of Hospital Administrators. CLAUDE W. MUNKER, M.D., New York, Director St. Luke's Hospital, Professor of Hospital Administration, Columbia University
Question and Answer period.

IMPROVING PERSONNEL RELATIONS AND PUBLIC RELATIONS Hotel Commodore

Wednesday 9:30 a.m.—12:30 p.m.—Grand Ballroom

Conducted by LEO M. LYONS, Chicago Executive Director St. Luke's Hospital.
Better People Make Better Hospitals—Good Personnel Relations Can Improve Quality of Personnel. EDGAR C. HAYHOW, East Orange, New Jersey, Director, East Orange General Hospital, President Elect, American College of Hospital Administrators.
Personnel Relations Affect Public Relations. OLIVER G. PRATT, Providence Executive Director, Rhode Island Hospital.
Why Every Hospital Should Have—(a) A Personnel Director and Define Personnel Policies, (b) Some Personnel Definitely Assigned Over-all Responsibility for Public Relations. FRANK D. BLOOMER, M.D., Buffalo Superintendent, Buffalo General Hospital, Associate in Medicine, University of Buffalo School of Medicine.

Orientation and Training of Hospital Personnel. MARY A. JOHNSON, New York, Research Associate, Hospital Administration School of Public Health, Columbia University.
Why Hospitals Must Consciously Enter Competition for the Public's Attention and What Means They Can Ethically Employ. CORNELIUS M. SMITH, New York President, Will, Folson and Smith.
Round Table Conference on Media for Informing the Public Regarding Hospitals.
Newspapers
Radio
Films and Slides
Forums and Talks
Tours and Demonstrations

Hospital Publications
Conducted by JOHN CORRELL, M.D., New York, Associate Professor of Hospital Administration, Columbia University School of Medicine

IMPROVING MEDICAL RECORDS IN HOSPITALS—JOINT SESSION WITH THE AMERICAN ASSOCIATION OF MEDICAL RECORD LIBRARIANS

Wednesday 2:00-5:00 p.m.—Seri Room
First Floor—The Waldorf Astoria

Conducted by ROBIN C. BUREKI, M.D., Philadelphia Director of Hospitals, University of Pennsylvania, Dean, Graduate School of Medicine.
A Message from the President of the American Association of Medical Record Librarians. EDNA C. BLACK, R.R.L., New Haven Medical Record Librarian, Grace Unit of the Grace New Haven Community Hospital, President of the American Association of Medical Record Librarians.
The Present Status of Training Medical Record Librarians Through—
(a) Approved Schools. EDNA K. HOFFMAN, R.R.L., Chicago, Director School for Medical Record Librarians, Wesley Memorial Hospital, Director Program in Medical Record Library Science, Northwestern University

(b) In Service Training Institute. MARGARET C. TAYLOR, R.R.L., Chicago, Field Instructor, Extension Course, American Association of Medical Librarians.
The Proper Approach to the Maintaining of Adequate Medical Records. MARGARET DEBOIS, M.D., Richmond, Assistant Director, Hospital Division, and Associate Professor of Hospital Administration, Medical College of Virginia School of Medicine.
The Responsibility of the Medical Staff of the Hospital in Maintaining Good Medical Records. MALCOLM T. MACFARLANE, M.D., Chicago, Associate Director, American College of Surgeons.
Impressions of the Field Representative of the American College of Surgeons in regard to Maintaining Adequate Medical Records. REAR ADMIRAL LUCIUS W. JOHNSON, San Diego, Assistant, Hospital Department, Assigned to Pacific Region.
Question and Answer Period. Conducted by ROBIN C. BUREKI, M.D., Chairman.

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Question and Answer Period. Conducted by ROBERT C. BURKE, M.D., Chairman.

A FORUM ON TRENDS IN HOSPITAL ADMINISTRATION NEW IDEAS AND PROCEDURES AND SPECIAL HOSPITAL PROBLEMS

Wednesday 8:00-10:30 p.m.—Sert Room—

First Floor—The Waldorf Astoria

Conducted by FRANK R. BRADLEY, M.D., St. Louis; Director Barnes Hospital, President, American College of Hospital Administrators.

Opportunity has been given to the graduates and administrative interns of the various Universities now offering

courses in hospital administration to present summary transcripts of new ideas and trends in hospital work, including planning and construction, improved equipment, new procedures and techniques, administrative problems, personnel management, public relations and other phases of hospital administration. From the totals of transcripts presented ten ten-minute presentations will be selected for discussion at this session.

FORUM ON SPECIAL PROBLEMS

Thursday 9:30 a.m.—12:30 p.m.—Sert Room—

First Floor—The Waldorf Astoria

Coordinator: ROBERT C. BUCKLEY, M.D., Philadelphia, Director of Hospitals, University of Pennsylvania, Dean Graduate School of Medicine

Topics for Discussion

The Modern Hospital—a Complete Synchronized Entity
New Developments in Each Group of Departments that Provide Unified Service to the Patient.

What Has Been Done to Meet the Present Acute Bed Shortage?

Present Status of Volunteer Workers in Hospitals.
Hospital Trustees, Members of the Medical Staff, Nursing Executives and Administrators Must Cooperate in Better Nursing Relations.

Are We Making Progress in the Care of the Chronically Ill?

Hospitals and the Cancer Problem—Cancer Clinics and Cancer Detection Centers.

Newer Services for the Modern Hospital—Physical Medicine and Geriatrics.

Planned Convalescence and Its Place in the Community
Adjusting Hospital Service to Medical Progress.

Interdepartmental Relations of the Pharmacy: How to Enhance Its Value and Appreciation by other Departments in the Hospital.

The Enlarging Educational Responsibilities of the Hospital.

Proper Use of the Medical Library

Incentives to Hold Employees—Including Retirement Plans.

ROUND TABLE CONFERENCE—SPECIAL PROBLEMS OF THE SMALL HOSPITAL IN MEETING THE STANDARDS OF THE AMERICAN COLLEGE OF SURGEONS

Thursday 2:00-5:00 p.m.—Sert Room—

First Floor—The Waldorf Astoria

Conducted by HARVEY AOKER, M.D., Toronto Secretary Canadian Hospital Council, Editor of *Canadian Hospitals*.

Topics for Discussion

Medical Staff Organization

Clinical Laboratory

X-ray Service

Medical Records

Nursing Service

Food Service

Pharmacy Service

Personnel Management

Public Relations

Care of Emergencies

EVA H. ERICKSON, M.H.A., Olean, New York; Super-Intendent, Olean General Hospital.

ELOISE B. FURUTAKA, M.H.A., Syracuse; Administrative Assistant, Syracuse Memorial Hospital.

WILLIAM G. ILLIEN, Whit Plains, New York; Administrator, White Plains Hospital Association.

GEORGE PRICE, Philadelphia; Administrator, Jewish Hospital.

MARSHALL L. PICKENS, Charlotte; Assistant Secretary, The Duke Endowment.

WILLIAM P. SLOVER, Manchester, Connecticut; Super-Intendent, Manchester Memorial Hospital.

ISABELLA N. WILLIAMS, Norwich, New York; Administrator, Chenango Memorial Hospital.

ROBERT G. WENTWORTH, Alexandria, Virginia; Administrator, Alexandria Hospital, Vice-President, The Hospital Council of the National Capital Area, Washington, D.C.

E. W. WILLIAMSON, M.D., Chicago; Assistant Director, American College of Surgeons.

SPECIAL CONFERENCE ON THE POINT RATING SYSTEM

Thursday 8:00-10:00 p.m.—Sert Room—

First Floor—The Waldorf Astoria

A Special Conference on the Point Rating System for Hospitals with Particular Discussion of Evaluation and Rating of Hospitals under this System.

Conducted by HARVEY G. FAIRER, M.H.A., M.D., Chicago;

Assistant, Hospital Department, American College of Surgeons.

Collaborators.

HARVEY AOKER, M.D., Toronto; Secretary Canadian Hospital Council, Editor *Canadian Hospitals*.

MALCOLM T. MACFARLANE, M.D., Chicago; Associate Director, American College of Surgeons.

PRELIMINARY CLINICAL PROGRAM

CLINICS IN NEW YORK HOSPITALS

Monday

BELLEVUE HOSPITAL

- 9:00-3:30. *Radiology* Permanent Exhibit, Monday through Friday Nonoperative Clinics. IRA I. KAPLAN and STAFF
- The Radiologic Treatment of Benign and Malignant Superficial Lesions. Irradiation as an Adjunct to Surgery. (1 and K Bldg., Ground FL—Capacity 15)
- The Place of Irradiation in the Treatment of Carcinoma of the Breast. (Same Rm.)
- A New Approach to the Treatment of Gastro Intestinal Malignancies by Radiation. (Same Rm.)
- Treatment of Carcinoma of the Cervix. (Same Rm.)
- Radiation Therapy as an Adjunct Method of Treatment in Genito Urinary Neoplasms. (Same Rm.)
- 9:00-4:00. *Röntgenology* Permanent Exhibit, Monday through Friday Nonoperative Clinics Röntgen Demonstrations of Surgical Disease
- Surgical Lesions of the Small Bowel Roentgenologically Considered. J. BUCKSTEIN (A. Ray Dept. I and K Bldg., Ground FL—Capacity 15)
- Surgical Problems of the Chest. PHILIP STRAU. (Same Rm.)
- Diagnostic Problems in Oesophagus Disease. M. ZURROW (Same Rm.)
- Diagnosis of Renal Surgical Disease. H. ZUCKERMAN (Same Rm.)
- Interesting Neuro-Surgical Cases. LEWIS J. FRIEDMAN and HERBERT LOEWEN. (Same Rm.)

BELLEVUE HOSPITAL—FOURTH (NEW YORK UNIVERSITY) SURGICAL DIVISION

- 1:30-3:30. *Surgery Specialties* (Operating Rooms K 5 and K-6). (Capacity of each operating room 5)
- Children's Surgery—Hernia. PHILIP ALLAN (Operating Room A)
- Children's Surgery—Chest. CHARLES W. LESTER (Operating Room B)
- Maxillofacial Surgery—Surgical Correction of Prognathism of the Mandible. LEO WINTER (Operating Room C)
- Orthopedic Surgical Clinic. ARTHUR KRIDA, JOHN McCULLY (Bone Room K-6)

BETH ISRAEL HOSPITAL

- 1:00-5:00. *Ophthalmology* Operative Clinic Clinical Demonstration of Endoscopic Treatment. MAX SOM and STAFF (E-N T. O.R. 12th Fl.—Capacity 6)
- Nonoperative Clinic on Results. MAX SOM and STAFF (Auditorium—Capacity 300)
- 1:00-5:00. *Ophthalmology* Nonoperative Clinic. EDWARD B. GARDNER and STAFF (3rd Fl. Classroom—Capacity 6)

FLOWER AND FIFTH AVENUE HOSPITALS

- 1:00-4:00. *Neurosurgery* Nonoperative Clinic "Slipped Disc" Operation and End Results. THOMAS I. HOEN (Auditorium, 106th St. Entrance—Capacity 300)
- 4:00-5:00. *Thoracic Surgery* Nonoperative Clinic: Trauma to Neck Involving the Mediastinum—or—Mediastinal Tumors. MILTON J. LLOYD. (Same Rm.)

HARLEM HOSPITAL

- 1:00-5:00. *Plastic Surgery* Nonoperative Clinic Symposium on Burns and Plastic Surgery. F. X. TOROWITZ, A. TAYLOR, A. GARNER and STAFF (Conference Rm. 5th Fl. Women's Pavilion—Capacity 100)

HOSPITAL FOR JOINT DISEASES

- 9:00-12:00. *Orthopedic Surgery* Operative Clinic Tendon Transplantation on the Hand. Transpositional Osteotomy at the Hip. LEO MAYER, HENRY MILLER (Surg. Amphitheater—Capacity 50)
- Follow up Demonstration
1. Result of Hallux Valgus Operation. PAUL LAPIDUS. (Prof. Serv. Bldg. Lecture Rm.—Capacity 60)
 2. (a) Transplantation of Extensor Carpi Ulnaris Tendon to Give Abduction of the Thumb (b) Meniscectomy of the Temporomandibular Joint (c) Fracture of Viphoid Viphoidectomy (d) Osteotomy Fusion of Hip. MICHAEL BURMAN (Same Rm.)
 3. (a) Slipping of the Femoral Epiphysis and Results by the Use of Internal Rotation Brace (b) Result of Osteotomy at the Hip Combined with Resection of Femoral Head. HENRY MILLER (Same Rm.)
 4. (a) Case Illustrating the Results of Tendon Transplantations and Nerve Suture, (b) Cases Illustrating Surgery of the Hand. LEO MAYER. (Same Rm.)
- 1:00-4:00. *Otolaryngology* Operative Clinic Nose and Throat Surgery. L. KLEINFELD (E-N T. Surg. O.R.—Capacity 5)

LENOX HILL HOSPITAL

- 1:00-4:00. *Plastic Surgery* Nonoperative Clinic: Demonstration of Cases. GORDON AUCHINCLOSS (Einhorn Auditorium—Capacity 450)

LYING-IN HOSPITAL

(See New York Hospital)

MANHATTAN EYE, EAR AND THROAT HOSPITAL

- 1:00-4:00. *Ophthalmology* Nonoperative Clinic. Demonstration Slit Lamp Demonstration. G. BONACCOLTO (5th Fl. Exam. Rm.—Capacity 15)
- Demonstration Corneal Grafting Technique on Rabbits. H. M. KATZ. (Same Rm.)
- 1:00-4:00. *Otolaryngology* Demonstration Biplane Fluoroscopy and Laminography. W. R. CARTER (X Ray Lab. 6th Fl.—Capacity 24)
- 3:00-5:00. *Ophthalmology* Demonstration Cases of Cataract Surgery Complicated by Glaucoma. M. A. LAST (Conference Rm. and FL—Capacity 24)

MEMORIAL HOSPITAL

- 10:00-12:00. *Tumor Surgery* Nonoperative Clinics Sloan Kettering Institute. Cancer Research in Relation to Clinical Problems
- Methods of Chemotherapy and Some Clinical Applications. (A survey of methods used in the screening program and their application to patients with leukemia.) J. BURCHENAL. (Auditorium—Capacity 250)
- Experiments on the Application of Chemotherapy Together with Conventional Methods. (Experimental

studies on the subject and examples of patients treated with mustards and x-rays) D. KARKOVSKY. (Same Rm.)

Cytochemical Studies of Mammary Cancer Including Observations During Hormone Therapy (Presentation of methods and findings which would not include any of the data that Dr. Adair might use in his talk.) R. MILLER. (Same Rm.)

Radioactive Iodine as a Tool in the Investigation and Treatment of Thyroid Cancer. F. FOOTE JR., Miss HULL. (Same Rm.)

Cases of Cancer of the Thyroid Treated with Radioactive Iodine. J. TRUMER, R. RAWSON. (Same Rm.)

METROPOLITAN HOSPITAL

100-400. *Neurosurgery* Nonoperative Clinic. Peripheral Vascular Clinic Including Sympathectomy. LOUIS R. KAUFMAN, S. THOMAS OLIVER, ALBERT LEBER, KENNETH C. PRACOCK, DAVID SCHERF. (Conference Rm.—Capacity 60).

MONTEFIORE HOSPITAL

100-400. *General Surgery* Nonoperative Clinic. SAMUEL STANDARD and STAFF. (Social Hall—Capacity 300).

400-500. *General Surgery* Nonoperative Clinic. Neoplastic Diseases. DANIEL LASKO. (Same Rm.)

MOUNT SINAI HOSPITAL

8:30-11:30. *Gynecology* Operative and Nonoperative Clinics

Parametrial Fixation Operation (Fothergill) Surgical Treatment of Urinary Strain Incontinence with Tanaka Plate. M. A. GOLDBERG. (Surg. Amphitheater—Capacity 60)

Conservative Surgery for Pelvic Endometriosis. JOSEPH GARDNER. (Same Rm.)

The Value of the Twenty-four Hour Pregnancy Test. Review of 500 cases. EMANUEL KLEMPERER. (Same Rm.)

The Clinical Value of Hystero-graphy. ARTHUR DAVID. (Same Rm.)

The Management of the Menopause. ROBERT I. WALTER. (Same Rm.)

100-500. *Neurosurgery* Nonoperative Clinics. Long Time Follow-up in Some Neurosurgical Cases. Case Presentations. ABRAHAM KAPLAN. (Surg. Amphitheater—Capacity 60)

Correlation of X-ray Findings and Clinical Picture. B. SCHERER. (Same Rm.)

Dumbbell Tumor of the Spine. IRA COHEN. (Same Rm.)

Craniospasty. Motion Picture Demonstration. S. GROSS. (Same Rm.)

NEW YORK EYE AND EAR INFIRMARY

100-300. *Otorhinolaryngology* Nonoperative Clinic. Frontal and Ethmoid Sinusitis—Preoperative and Follow-up. STUART L. CRAIG. (Clinic Rm.—Capacity 30)

100-300. *Otorhinolaryngology* Nonoperative Clinic. Adenoid Sinusitis—Preoperative and Follow-up. EARL F. LINDBACH. (Same Rm.)

400-600. *Otorhinolaryngology* Operative Clinic. Sinus Surgery. STUART L. CRAIG. (Same Rm.)

400-600. *Otorhinolaryngology* Operative Clinic. Surgery of the Antrum. EARL F. LINDBACH. (Same Rm.)

100-500. *Ophthalmology* Nonoperative Clinic. Preoperative Diagnostic Study. CONRAD BERNHEIM, H. ROMANIK and ASSOCIATES.

Preoperative and Postoperative Glaucoma Studies. W. KESKINGTON, H. ELWYN and ASSOCIATES.

Plastic Surgery Methods. W. HOOKER, J. COLE and ASSOCIATES. (Eye O.R. 10)

Special Lenses—Contact, Anisclonic and Telescopic Exhibit. (Clinic Fl.—Capacity 30)

The routine clinics of the New York Eye and Ear Infirmary will be held as usual during this period, all Fellows of the American College of Surgeons are cordially invited to attend.

NEW YORK HOSPITAL

100-500. *Genitourinary Surgery* Nonoperative Clinic. Demonstration. Surgical Anatomy. ERNEST LAMPE. (Bldg. A, Rm. 32—Capacity 50)

100-400. *General Surgery* Nonoperative Clinic. Demonstration. Surgical Anatomy. Detailed Anatomy of Radical Neck Dissection. ERNEST LAMPE. (Same Rm.)

100-500. *Otolaryngology*. Operative Clinic. Reconstructive Surgery of the Nose. ARTHUR PALMER. (10th Fl. O.R.—Capacity 30)

NEW YORK HOSPITAL

LYING-IN HOSPITAL

100-500. *Obstetrics and Gynecology* Nonoperative Clinics. Cryptomenorrhea—Congenital and Acquired. THOMAS L. BALL. (Lecture Room—Capacity 60)

Result of an Operation for Urinary Incontinence. ANDREW A. MARCHETTI, VICTOR MARSHALL. (Same Rm.)

Pregnancy Following Outlet Operation. WILLIAM FIDEL. (Same Rm.)

Studies on Patients with Hydramnios During the Past Fifteen Years. PAUL E. MULLER. (Same Rm.)

End-Results of the Treatment of Carcinoma of the Endometrium. ANDREW A. MARCHETTI, JOHN E. McALLISTER. (Same Rm.)

Radiological Survey of Breeches. H. L. WILSON. (Same Rm.)

NEW YORK ORTHOPEDIC DISPENSARY AND HOSPITAL

8:00-100. *Orthopedic Surgery* Operative Clinic. ALAN DE FOREST SMITH and STAFF. (O.R. 1 and 2—Capacity 60)

10-400. *Orthopedic Surgery* General Orthopedic Clinic. HALFORD HALLOCK and STAFF. (7th Fl. Assembly Rm.—Capacity 30)

Congenital Club Foot Clinic. JOHN McCARTHY. (Same Rm.)

NEW YORK POST-GRADUATE MEDICAL SCHOOL AND HOSPITAL

8:30-100. *Tumor Surgery* Operative Clinic. H. W. MEXER. (O.R. 2—Capacity 10)

10-30. *Tumor Surgery* Nonoperative Clinic. Treatment and Late Results in Carcinoma of the Head, Neck and Breast. H. W. MEXER and STAFF. (Edmann Auditorium—Capacity 50)

100-500. *Vascular Surgery* Operative Clinic. GERALD PRATT. (O.R. 1—Capacity 10)

100-500. *General Surgery* Operative Clinic. J. W. HEDDER. (Amphitheater—Capacity 30)

100-500. *Orthopedic Surgery* Operative Clinic. G. ANTON. (O.R. 3—Capacity 10)

PRESBYTERIAN HOSPITAL

100-400. *General Surgery* Nonoperative Clinic. Carcinoma of the Tongue. A General Hospital. Analysis of 100 cases. JOHN M. HANCOCK. (McComb Amphitheater 18th Fl.—Capacity 140)

- Lymphatic Spread of Carcinoma of the Rectum and Colon. ROBERT S. GARDNER. (Same Rm.)
- Röntgen Diagnosis of Carcinoma of the Stomach. ROSS GOLDEN. (Same Rm.)
- Extent of Resection of Stomach for Carcinoma, Correlation with Experimental Mucus Transformation. Case Demonstration. EDWARD L. HOWES. (Same Rm.)
- Chemotherapy of Malignancy with Nitrogen Mustard. ALFRED GREENBERG. (Same Rm.)
- Surgical Anatomy. Demonstration of Autonomic Nerve Supply of the Gastrointestinal Tract. JOSEF FRIEDL. (Rm. 514, 10th Fl. Phys. & Surg. Bldg.—Capacity 50)
- Structures of the Female Perineum. PHILIP WITTELL. (Same Rm.)

PRESBYTERIAN HOSPITAL NEUROLOGICAL INSTITUTE

- 9:00-11:00. *Neurosurgery* Nonoperative Clinic. Neurosurgical Staff Conference. Clinical preview of surgical cases to be operated upon Tuesday and Friday mornings. Surgical Staff (Conference Rm. and Fl.—Capacity 60)
- Note: Regular operative clinics will be held every morning as usual and the visitors are welcome to attend.

PRESBYTERIAN HOSPITAL SLOANE HOSPITAL FOR WOMEN

- 10:00-12:00. *Obstetrics and Gynecology* Nonoperative and/or Operative Clinic. Demonstration of Delivery Room Technique and Teaching. Demonstration of Operative Obstetrics (if Cases Available). CHARLES STEER, ANTHONY D'ESORO, HOWARD C. MOLT. (17th Fl. Clinic or O.R. or Lecture Rm.—Capacity 50)

PRESBYTERIAN NEW YORK ORTHOPEDIC HOSPITALS Fracture Service

- 1:30-4:00. *Fractures and Traumatic Surgery* Nonoperative Clinic. Fracture Clinic. The Low Back Problem. SAWYER R. GASTON. (Rm. 417 16th Fl. Phys. and Surg. Bldg.—Capacity 100)
- Three, Four and Five Year Hip Fracture Follow-up Results. CHARLES S. NEILL. (Same Rm.)

ROOSEVELT HOSPITAL

- 1:00-4:00. *General Surgery* Nonoperative Clinic. Discussion. Post-Graduate Education of the Surgical Residents and Interns. CHARLES F. STEWART. (Conference Rm. 1—Capacity 50)
- 2:30-5:00. *Fractures and Traumatic Surgery* Nonoperative Clinic. Traumatic and Reconstructive Surgery of the Hand. CHARLES F. STEWART. (Conference Rm. 2—Capacity 50)
- The Early Treatment of Hand Injuries (Emergency Treatment). CONNOR W. CUTLER. (Same Rm.)
- The Repair of Finger Tip Injuries. HENRY A. KINGSBURY. (Same Rm.)
- The Temporary Repair of Severed Flexor Tendons of the Fingers. R. STELLING MUELLER. (Same Rm.)
- Reconstructive Surgery of the Hand. WILLIAM LATTIER.

ST LUKE'S HOSPITAL

- 8:30-11:00. *General Surgery* Operative Clinic. WILLIAM MACFARLANE and STAFF. (Lyle O.R.—Capacity 30)
- 11:00-1:00. *General Surgery* Nonoperative Clinics. Clinical Demonstrations. Neurofibromas of Stomach, six cases. JOHN WEST. (Staff Conference Rm.—Capacity 60)
- Management of Polyps of Colon and Rectum. PAUL MORTON. (Same Rm.)

- Adenocarcinoma of Colon and Rectum with Metastasis to Ovaries, illustrative cases. WILLIAM BERRY. (Same Rm.)
- Malignant Tumors of the Appendix. STAFFORD WEARN. Bleeding Duodenal Ulcers. ROBERT FRASER. (Same Rm.)
- Trends in Current Technique of Anesthesia. EDWARD BORDOW. (Same Rm.)
- 1:00-5:00. *Orthopedic Surgery* Operative Clinic. MATTHEW CLEVELAND and STAFF. DAVID BOSWORTH. (Lyle O.R.—Capacity 30)

ST VINCENT'S HOSPITAL

- 9:00-12:00. *General Surgery* Operative Clinic. General Surgery. RAYMOND P. SULLIVAN, JOHN A. LAWLER and GEORGE R. STUART. EDWARD DENCKEN. (Ward Bldg. O.R. A and B—Capacity 5 each, C, D and E—Capacity 10 each, F—Capacity 5)
- 9:00-12:00. *Thoracic Surgery* Nonoperative Clinic. Group Conference. Selection of Cases for Thoracoplasty, Lobectomy and Pneumonectomy. DANIEL MULVIHILL. (Nurse's Lecture Rm. and Fl.—Capacity 60)
- 9:00-12:00. *Radiology* Nonoperative Clinic. Röntgen Diagnosis of Thoracic Tumors. WILLIAM W. MAYER and ASSOCIATES. (Ward Bldg. Viewing Rm.—Capacity 25)
- 10:00-12:00. *Neurosurgery* Nonoperative Clinic. Follow up Study of a Series of Herniated Discs with Fusion of Spine. JAMES T. DANIELS, ANTHONY PIRAGI. (Nurse's Auditorium—Capacity 150)
- 1:00-5:00. *Pathology* Nonoperative Clinic. Clinical Pathological Demonstration of Hodgkin's Disease. Growth of Tissue Anterior Chamber of the Eye of Mice. ANTHONY ROTTINO. (Nurse's Auditorium—Capacity 60)
- Display and Demonstration of System Diseases by Kodachrome Slides. JOHN KRATING. (Same Rm.)
- Display of Fixed Specimens. WILLIAM F. MEEHAN. (Same Rm.)

U. S. MARINE HOSPITAL (STATEN ISLAND)

- 10:00-12:30. *General Surgery* Nonoperative Clinic. Inguinal Hernia (Follow-up Study). Postoperative Inguinal Hernia. HOMER L. SKINNER and STAFF. (Doctor's Staff Rm.—Capacity 75)
- 12:30-1:30. Luncheon at the Hospital.
- 1:00-3:00. *General Surgery* Operative Clinic. Inguinal Hernia under Spinal or Continuous Caudal Anesthesia. HOMER L. SKINNER and STAFF. (General O.R., 4th Fl.—Capacity 30)
- 3:00-3:30. *Auralis*. Nonoperative Clinic. Diagnostic and Prognostic Regional Block Clinic. C. L. HENERT and STAFF. (General O.R.—Capacity 5)

VETERANS ADMINISTRATION HOSPITAL

- 1:00-3:30. *General Surgery* Nonoperative Clinic. General Surgical Conference. FREDERICK W. BANCROFT, FOR DYCE B. ST. JOHN, ALLEN O. WHIPPLE, P. K. SAUER, CARLOS WEEKS, JOHN E. SULLIVAN, EDWIN SELF, DAVID K. POKOR, MARTIN J. HEALY and RESIDENT STAFF. (Bldg. A, 3rd Fl.—Capacity 100)
- 3:00-4:00. *General Surgery* Operative Clinic. Endoscopy. DAVID H. JONES, HENRY THALER. (Bldg. B, 5th Fl.—Capacity 5)
- 3:30-5:00. *Radiology* Nonoperative Clinic. Radiological Conference. CHARLES GOTTILIER, ARTHUR SIEGHELL, MAXWELL H. PORFEL, and STAFF. (Bldg. A, 3rd Fl.—Capacity 100)

EXHIBITS (Bldg. A, 3rd Fl.)

Anesthesia Section
Bronchopulmonary Carcinoma
Review of 600 Cases

Intracranial Neoplasms
Residency Training
Program

Organization of Surgical
Division
Results of Vagus Resection
Pathology Section

Medical Illustrations
Laboratory
Plastic Surgery
Prosthetic Appliances

CLINICS IN BROOKLYN—LONG ISLAND HOSPITALS

Monday

CUMBERLAND HOSPITAL

8:00-5:00. *General Surgery* Statistical Study Discussion of Postoperative Complications. DAVID J. GRAUBARD (Auditorium—Capacity 300).
Use of Sulfonamides in Acute Abdomen. MICHAEL VINCIGIARO. (Same Rm.)
Preoperative and Postoperative Treatment in Gastrointestinal Surgery. HARVEY COOPERMAN. (Same Rm.)
Advantages of Miller Abbott Tube in Small Bowel Obstruction. CESAREO CASTELLANETA. (Same Rm.)

Late Results in Surgery of Gastrointestinal Malignancy with Pathological Demonstration. HAROLD AXELSON

METHODIST HOSPITAL

9:00-1:00. *Plastic Surgery* Operative and Nonoperative Clinic: Plastic Repair of Cleft Palate. JOHN F. FORD. (Main O.R. 1-6—Capacity 1)
9:00-5:00. *Otolaryngology* Operative and Nonoperative Clinic: Otolaryngology. CHARLES A. ANDERSON, EDWIN A. STOWIE and STAFF. (Main O.R. 1-6—Capacity 50)

CLINICS IN NEW YORK HOSPITALS

Tuesday

BABIES HOSPITAL (See Presbyterian Hospital)

BELLEVUE HOSPITAL—FIRST (COLUMBIA UNIVERSITY) SURGICAL DIVISION

8:00-9:00. *General Surgery* Operative Clinic: FRANK B. BERRY and STAFF (O.R. A, B, C & D—Capacity 50)
8:00-1:00. *Thoracic Surgery* Operative Clinic: FRANK B. BERRY and STAFF (O.R. C & D—Capacity 1)
9:30-1:30. *Neurosurgery* Clinic (Stewart Amphitheatre 1 & 2 Bldg., Ground Fl.—Capacity 50)
Surgical methods in Treatment of Hypertension. CARLOS WIEGERS.
Chronic Thyroiditis. J. GORDON LEE.
Enterogenous Cysts. JAMES T. HAGO.
Treatment of Chronic Leg Ulcers by Fasciotomy. BENJAMIN J. REAM.
Preliminary Report Concerning Method for the Study of Peripheral Arterial Diseases. AARON HODGKINSON.

BELLEVUE HOSPITAL—SECOND (CORNELL UNIVERSITY) SURGICAL DIVISION

10:00-5:00. *Neurosurgery* Operative and Nonoperative Clinic. JOSEPH KING and WINFRED WINGENBACH. LAWRENCE POOL and HERBERT REINERT (O.R. K 5—Capacity 30)

BELLEVUE HOSPITAL—THIRD (NEW YORK UNIVERSITY) SURGICAL DIVISION

8:00-1:00. *Anesthesia* Operative and Nonoperative Clinic. Demonstrations. Anesthesia in Thoracic Surgery. E. A. ROYENSTONK and STAFF (5th Fl. C & D Bldg.—Capacity 5)
10:00-5:00. *General Rehabilitation* in General Hospital. Methods of Admission to Wards. GEORGE DRAVER, C. H. FURRY, J. (Wards F & G-3, F & G Bldg.—Capacity 5)

BETH ISRAEL HOSPITAL

9:00-1:00. *Plastic Surgery* Operative Clinic: ARTHUR E. BARKSY (O.R. A, 5th Fl.—Capacity 6).
1:00-5:00. *Genitourinary Surgery* Operative Clinic. STEPHEN WILHELM and STAFF. (Main O.R.—Capacity 30)
Nonoperative Clinic. STEPHEN WILHELM and STAFF (Auditorium—Capacity 300)

FLOWER AND FIFTH AVENUE HOSPITALS

9:00-1:00. *General Surgery* Operative Clinic: BREAST SURGERY. HERBERT C. CHASE. (Main O.R. 8th Fl.—Capacity 1)
Nonoperative Clinic: Biological Studies in Malignancy. I. S. KLEINER, M. M. BLACK. (Auditorium—Capacity 300)
10:00-1:00. *General Surgery* Nonoperative Clinic: Tumor Clinic. GEORGE T. PACK, JOHN Q. VISTA, GEORGE K. HODGES, and FRANK J. BOWELL. (Same Rm.)
12:00-4:00. *Thoracic Surgery* Nonoperative Clinic. Surgical Treatment of Angina Pectoris by the Establishment of Adhesive Pericarditis. Selection of the Patients; Operative Technique; Follow-up Results. SAMUEL A. THOMPSON, and M. J. RAINBORN. (Same Rm.)
4:00-5:00. *Gynecology* Nonoperative Clinic: Mammoplasty (Ayers Forceps, etc.) or—Ovarian Transplants. Two short moving pictures. BENJAMIN TOLL, HORACE AYER. (Same Rm.)

GOLDWATER MEMORIAL HOSPITAL— SECOND SURGICAL DIVISION

9:30-1:30. *Geriatric Surgery* Operative Clinic. CONRAD CUTLER and STAFF
Adductor Tenotomy and Obturator Nerve Section for Adductor Spasm. (Adm. Bldg., Main O.R. 3rd Fl.—Capacity 30).
Repair of Scrotal Hernia, Local Anesthesia. (Same Rm.)

PRELIMINARY PROGRAM—1947 CLINICAL CONGRESS

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Amputation of Leg for Arteriosclerotic Gangrene: Re-
frigeration Anesthesia. (Same Rm.)
10:30-12:00. *Geriatric Surgery* Nonoperative Clinic: Case
Presentations

Anesthesia Methods in Bad Risk Patients. E. A. ROVEN
STEIN. (North Conference Rm., 3rd Fl. Between C
and D Pavilion—Capacity 50)

Clinical Studies in Chronic Peripheral Vascular Occlu-
sion. GRANT P. PENNYCOCKER. (Same Rm.)

Indications and Results of Hernia Repair in Old Pa-
tients. GEORGE STREIMER. (Same Rm.)

Problems in Chemical Balance in Geriatric Surgery
LOUIS CASE. (Same Rm.)

Dicoumarol and Other Anticoagulant Drugs. W. E.
ALSOOP. (Same Rm.)

Treatment of Chronic Bone Suppuration. F. B. ROTM.
(Same Rm.)

Cholecystitis Complicating Chronic Disease States.
W. T. MENDEL. (Same Rm.)

Urgent Surgery in the Aged. CONNOR W. CUTLER, JR.
(Same Rm.)

Clinical Pathological Demonstration. JULIUS ROSEN
THAL. (Same Rm.)

12:00-1:00. *Geriatric Surgery* Nonoperative Clinic: Case
Presentations

Arachnoiditis. JONATHAN OLJENICK. (B11 and B2—Capac-
ity 50)

Clinical Evaluation of Cystometric Readings. J. E.
BEAUMER. (Same Rm.)

Preliminary Report on the Experimental Studies of Ob-
struction at the Vesical Neck Complicating the Neu-
rogenic Bladder. ANDREW SPORER. (Same Rm.)

Vesical Neck Obstruction in the Female. LISA A. SALTZMAN
(Same Rm.)

Treatment of Incontinence in a Hospital for Chronic
Diseases. SAMUEL SOTTER. (Same Rm.)

Suprapubic Prostatectomy Modified Harris Technique
with Complete Closure. S. A. RITTER. (Same Rm.)

WARD ROUNDS

9:00-12:00. *Harlem Hospital*

Trauma Symposium and Ward Rounds: Injuries of
the Chest and Abdomen. R. L. YOUNG, J. C. WERT
AKER, R. S. WILKINSON, M. LOOAN, F. R. ALLEN,
Main Bldg. and Conference Rm. 5th Fl. Women's
Pavilion—Capacity 25

12:00-3:00. *Genitourinary Surgery* Nonoperative and Op-
erative Clinic: Genitourinary Conference, Ward
Downstairs and Operative Clinic. N. F. LASKY, E.
3C—Capacity 25

3:00-5:00. *Roentgenology* Nonoperative Clinics: Roent-
genology in Surgery

Regional Ileitis—Intestinal Obstruction. L. GINSBURG.
(Conference Rm. 5th Fl. Women's Pavilion—Capac-
ity 100)

Duodenal Loop Triad. WILLIAM SNOW. (Same Rm.)

HOSPITAL FOR JOINT DISEASES

9:00-12:00. *Orthopedic Surgery* Operative Clinic: Spine
Fusion for Scoliosis. Sauerization for Chronic Osteo-
myelitis. SAMUEL KLEINBERG, JOSEPH BUCHMAN
THOMAS HORWITZ. (Surg. Amphitheater—Capacity
50)

Nonoperative Clinic: Miller Operation for Flat Feet.
Use of Penicillin in the Operative Treatment of
Chronic Osteomyelitis. The Operative Treatment of
Cavus. Drilling of Incipient Epiphyseolysis at the

Hip. SAMUEL KLEINBERG, JOSEPH BUCHMAN THOMAS
HORWITZ. (Lecture Rm.—Capacity 60)

12:00-4:00. *Orthopedic Surgery* Nonoperative Clinic: Spec-
imen Demonstration: The Pathology of Bones and
Joints. HENRY JAFFE. (Same Rm.)

12:00-4:00. *Gynecology* Operative Clinic: Total Hysterec-
tomy for Uterine Tumors. Nonoperative Clinic: Fol-
low-up Results of Total Hysterectomy for Uterine
Tumors. HAROLD DAVIDSON. (Surg. Amphitheater—
Capacity 50)

12:00-4:00. *Plastic Surgery* Operative Clinic: Nasoplasty
Follow-up Clinic: Nasal, Lip and Face Plastic.
LEOPOLD GLUBERMAN. (Small O.R.—Capacity 5)

HOSPITAL FOR SPECIAL SURGERY

8:30-12:00. *General Surgery* Operative Clinic: Operations
by General Surgical Department. F. BEELMAN and
STAFF (Main O.R.—Capacity 35)

9:00-12:00. *Orthopedic Surgery* Nonoperative Clinic:
Children's Orthopedic Problems. PHILIP D. WILSON
and STAFF (Lecture Hall—Capac-
ity 100)

12:00-5:00. *Orthopedic Surgery* Nonoperative Clinic—
Knee Problems

Knee Capsuloplasty. LEWIS CLARK WAGNER. (Same
Rm.)

Quadricepsplasty to Improve Knee Function. T. CAMP-
BELL THOMPSON. (Same Rm.)

Conservative Treatment of Fractures of the Tibial
Plateau. ROBERT LEE PATTERSON. (Same Rm.)

Unusual Pathological Conditions Found in Knee Joints.
MILTON HELPERMAN. (Same Rm.)

Old Pathological Fractures of Femora Treated with
Knautecher Nail. JOHN R. COSS. (Same Rm.)

LENOX HILL HOSPITAL

9:00-11:00. *General Surgery* Operative Clinic. FRANKS
M. DOMINOVITZ and STAFF (O.R. 1 and 2—Capacity
each 15)

11:00-12:00. *General Surgery* Nonoperative Clinic: Ther-
apeutic Considerations in Acute Small Bowel Obstruc-
tion. ROBERT C. CROWLEY. (Elmhurst Auditorium—
Capacity 450)

12:00-5:00. *Urology* Nonoperative Clinics: Late Results
of Unusual Cases

Bilateral Stag Horn Renal Calculi. WILLIAM R. DEL
ZELL. (Elmhurst Auditorium—Capacity 450)

Stag Horn Calculus in Abnormally Rotated Pigeon Kid-
ney. HERBERT KATZMAN. (Same Rm.)

Horseshoe Kidney Resection of Hydronephrotic Half
MAXIMILIAN NEMER. (Same Rm.)

Operative Treatment of Large Dendritic Calculi of Soli-
tary Kidney. GEORGE SLAUGHTER. (Same Rm.)

LYING-IN HOSPITAL
(See New York Hospital)

MANHATTAN EYE, EAR AND THROAT
HOSPITAL

9:00-12:00. *Ophthalmology* Operative Clinic: Surgical
Treatment of Ptoxis of Lids, Operation and Results.
GURMERT FRYE. (Frey Clinic, 1st Fl., and Eye O.R.—
Capacity 5)

9:00-12:00. *Otolaryngology* Operative Clinic. Nasal
Plastic Operation. A. SCHATZNER. (O.R. 7th Fl.—
Capacity 5)

10:00-12:00. *Otolaryngology* Demonstration. Postopera-
tive Cases of Laryngectomy—Esophageal Voice Train-
ing. D. S. CUSHING. (Broncho. Clinic, 3rd Fl.—
Capacity 15)

- 3:00-4:00. *Ophthalmology* Operative Clinic Surgical Treatment of Strabismus, Operations and End Results. F. C. KELL. (Eye O.R., 6th Fl.—Capacity 5)
- 4:00-5:00. *Ophthalmology* Orthoptic Clinic. F. C. KELL, JR., E. KNAUBER. (Orth. Clinic, 1st Fl. Rear—Capacity 1)
- 5:00-7:00. *Otolaryngology* Operative Clinic: Laryngotomy D. S. CONNING (7th Fl. O.R.—Capacity 5)
- 7:00-8:00. *Otolaryngology* Operative Clinic: Nasal Plastic Operation. WILLIAM B. ALLAN (7th Fl. O.R.—Capacity 5)
- 8:00-9:00. *Otolaryngology* Clinicopathological Demonstration: Malignancy of the Larynx. A. A. EGGERTS, D. S. CONNING. (Conference Rm. 2nd Fl.—Capacity 50)

MEMORIAL HOSPITAL

- 8:00-9:00. *Tumor Surgery* Operative Clinics. FRANK E. ADAMS, O. E. BINKLEY, B. L. COLEY, A. L. DEAN, V. F. MARSHALL, HAYES MARTIN, OYGEOR T. PACK, O. H. TWOMBLY, W. L. W. TUCKER (O.R. A—Capacity 5; O.R. B—Capacity 5; O.R. C—Capacity 5; O.R. D—Capacity 5; O.R. E—Capacity 5)
- 9:00-10:00. *Tumor Surgery* Nonoperative Clinics: Discussion.
- The Memorial Hospital Nomenclature for Cancer and Its Usefulness in Cancer Hospitals, Cancer Clinics, and Cancer Commissions. ELIZABETH MACDONALD. (Auditorium—Capacity 50)
- The Necessity for Uniform and Accurate Methods of Reporting Cancer Statistics: Cure Rates in Cancer Based Upon Total Experience. HAYES MARTIN (Same Rm.)
- The Organization of the Statistics Department of Memorial Hospital and a Report of Five-year End-Results in Various Anatomic Forms of Cancer as Calculated by the Statistics Department to Date. MARY MACDONALD. (Same Rm.)
- 10:00-11:00. *Tumor Surgery*, Nonoperative Clinic: Follow-up Patients With Total Laryngectomy for Cancer of the Larynx. (Same Rm.)
- 11:00-12:00. *Tumor Surgery* Nonoperative Clinic: Follow-up Patients Illustrating Combined Neck Dissection and Excision of Primary Lesions of the Mouth. (Same Rm.)

METROPOLITAN HOSPITAL

- 9:00-10:00. *General Surgery* Operative and Nonoperative Clinic: Thyroid Surgery and Resident Training. JAMES M. WENTFIELD and STAFF (Main O.R. and Conference Rm.—Capacity 60)
- 10:00-11:00. *Genitourinary Surgery* Operative Clinic: Plastic Correction of Hydronephrosis, Ureterodysgenesis. SPRAGUE CARLETON and STAFF (Main O.R.—Capacity 30; O.R.—Capacity 5; O.R. 3—Capacity 5)
- Nonoperative Clinic: Demonstration Selected Cases Exhibit of Staff Training; Clinical Exhibit. SPRAGUE CARLETON and STAFF (Same Rm.)

MONTEFIORE HOSPITAL

- 3:00-4:00. *General Surgery* Nonoperative Clinic: Mildly Amputations in Diabetes. SAMUEL SILBERT (Social Hall—Capacity 300)

MOUNT SINAI HOSPITAL

- 8:30-10:00. *Genitourinary Surgery* Operative Clinic: Resection of the Rectum. Colectomy for Ulcerative Colitis. JOHN GARLOCK. (Surg. Amph.—Capacity 100)

- Nonoperative Clinic and Case Presentations. JOHN GARLOCK, LEON GINSBURG, SAMUEL KLEIN, ARTHUR GLASS, GABRIEL STELEY. (Same Rm.)
- 12:00-1:00. *Orthopedic Surgery* Operative and Nonoperative Clinic. ROBERT LIPPMAH, ALBERT SCHULZ, EDGAR BICK. (Same Rm.)

NEUROLOGICAL INSTITUTE

(See Presbyterian Hospital)

NEW YORK EYE AND EAR INFIRMARY

- 10:00-11:00. *Otolaryngology* Demonstration: Soundproof Room and Testing. J. SWIFT HANLEY. (Soundproof Rm. and Adjacent Rm.—Capacity 30)
- 11:00-12:00. *Otolaryngology* Demonstration: Frontal Sinus Surgery by Motion Pictures. J. SWIFT HANLEY. (Same Rm.)
- 4:00-6:00. *Otolaryngology* Nonoperative Clinic: Sinus Surgery. J. SWIFT HANLEY. (Weeks Hall—Capacity 50)
- 4:00-6:00. *Otolaryngology* Nonoperative Clinic: Radical Mastoidectomy. VIRGINIUS B. HIRST.
- 8:00-9:00. *Ophthalmology* Nonoperative Clinic. Postoperative Results with Study of Operative Complications. BOYES and ASSOCIATES.
- The Distribution of Newly Examined Patients and Outlines for Further Studies. R. PAYNE and R. MCCASLAN and ASSOCIATES. (Clinic Rm.—Capacity 30)
- Operative Clinic: Surgical Techniques with Reference to Lids and Glaucoma. R. MINK and W. JONKHOFF and ASSOCIATES. (Eye O.R.—Capacity 10)
- Orthoptic Department—Muscle Anomalies. (Orthoptic Clinic—Capacity 30)
- The routine clinics of the New York Eye and Ear Infirmary will be held as usual during this period, all Fellows of the American College of Surgeons are cordially invited to attend.

NEW YORK HOSPITAL

- 9:00-10:00. *Thoracic Surgery* Operative and Nonoperative Clinics. FRANK GLENN and STAFF
- Surgery of Mediastinal Tumors. WILLIAM DEW ANDERSON. (10th Fl. Amphitheater and Rm. F-630—Capacity 60). Follow-up Studies of Mediastinal Tumors. JOHN ECKER. (Same Rm.)
- Chronic Constrictive Pericarditis. Surgical Aspects. WILLIAM DEW ANDERSON. (Same Rm.)
- Diagnosis of Carcinoma from Degenerated Cells. GEORGE PAPADAKALOS. (Same Rm.)
- Clinical Value of Sputum Diagnosis. HENRY CHOCHELLI. WILLIAM A. BAUMER. (Same Rm.)
- 9:00-10:00. *Genitourinary Surgery* Operative and Nonoperative Clinics. (From the Department of Surgery, New York Hospital—James Buchanan Brady Foundation).
- Perineal Prostatectomy. THOMAS J. KIRWIN. (Surg. Amphitheater—Capacity 100)
- Demonstration of Spinal Anesthesia. ROSE ARNOLD. (Same Rm.)
- Uretropericic Obstruction. ROY B. HENKLE. (Same Rm.)
- Absorbable Gauze in Urologic Surgery. GEORGE FRIEDLER. (Same Rm.)
- Case Report. THOMAS P. TWIDDE. (Same Rm.)
- True Adrenal Tumor of Kidney. ROBERT W. HUNT. (Same Rm.)
- Ureteral Obstruction in Relation to Psychosis. C. K. CHURCH. (Same Rm.)
- Treatment of Bladder Tuberculosis with a New Instrument and Method. STANLEY WANG. (Same Rm.)

- Glands in Female Urethra of the Infant. FRANCIS BENKE VENTIL. (Same Rm.)
- Foreign Body in Ureter. ALBERT VIERCKS-PLAUER. (Same Rm.)
- Transplantation of Ureters. ALFONSO AVALOS. (Same Rm.)
- Case Report. PAUL BOYD ALBERTO GENTILE, WAYNE HANSON CECIL HAWES. (Same Rm.)
- Demonstration of Drawings of Interesting Urological Cases and Operations. WILLIAM P. DIDURCH. (Room F-956—Capacity 100)
- Motion Pictures of Urological Operations. WILLIAM P. DIDURCH. (Room F-901—Capacity 100)
- 1:00-5:00. *General Surgery* Nonoperative Clinic: General Surgery. FRANK GLENN and STAFF
- The Resident System in Surgical Training at the New York Hospital. FRANK GLENN. (Room B-001—Capacity 350)
- Follow-up Results—Carcinoma of Breast, Stomach, Colon, Rectum. WILLIAM A. COOPER. (Same Rm.)
- Organization of Follow-up Clinic. BROOKS S. RAY. (Same Rm.)
- Demonstration. Follow up Clinic Staff. (Same Rm.)
- 1:00-5:00. *Gynecology* Operative and Non-operative Clinics
- The Treatment of Bladder Tumors (From the Department of Surgery, Cornell University Medical College, and Memorial and Bellevue Hospitals). VICTOR F. MARSHALL and STAFF
- Classification of Bladder Tumors. JOHN W. DRAPER. (Surg. Amphitheatre—Capacity 100)
- Results of Radiation Therapy of Bladder Tumor. VICTOR F. MARSHALL. (Same Rm.)
- Transurethral Treatment of Bladder Tumors. ALLISTER M. MCLELLAN. (Same Rm.)
- Bladder Resection for Bladder Tumor. J. EDWIN DREW. (Same Rm.)
- Uretero-Cutaneous Transplantation. GUSTAVUS A. HUMPHREYS. (Same Rm.)
- Ureterointestinal Anastomosis. MORRIS SCHNEITMAN. (Same Rm.)
- Total Cystectomy. WILLET F. WHITMORE. (Same Rm.)
- Management of Advanced Carcinoma of the Bladder. ROBERT S. HOTCHKISS. (Same Rm.)
- Summary and Conclusions. VICTOR F. MARSHALL. (Same Rm.)
- 1:00-5:00. *Otolaryngology* Operative Clinic: Surgery of the Mastoid. GERVAIS MCGAULFEE. (10th Fl. O.R. 1 Rm.—Capacity 30)
- 1:00-4:00. *General Surgery* Nonoperative Clinic: Surgical Anatomy Demonstration. Anatomy of the Hand Involved in Infection and Trauma. ERNEST W. LAMPE. (Room A 133—Capacity 15)

NEW YORK HOSPITAL LYING-IN HOSPITAL

- 9:00-12:00. *Obstetrics and Gynecology* Operative and Non-operative Clinics
- Operation for Correction of Prolapse. BYRON GOFF. (Gyn. O.R., 2 Rms.—Capacity 50)
- Extrapelvic Cesarean Section. CURTIS MICKELSON. (Same Rm.)
- Extrapelvic Cesarean Section (moving picture). HERVEY WILLIAMSON. (Lecture Rm.—Capacity 100)
- 1:00-5:00. *Obstetrics and Gynecology* Nonoperative Clinic: Artificial Impregnation—Late Results. WILLIAM H. CAREY. (Same Rm.)
- Clinic for Treatment and Study of Amenorrhea. RALPH W. GAUTIER. (Same Rm.)

- Cardiac Disease in Pregnancy. CURTIS L. MICKELSON. (Same Rm.)
- Transfusion Reactions Due to Rh Incompatibility. ELMER KRAMER. (Same Rm.)
- Obstetrical Experience in Rh-negative Women. JOHN T. COLE. (Same Rm.)
- End-Results of Patients with Infertility. CHARLES M. McLANE. (Same Rm.)

NEW YORK ORTHOPEDIC DISPENSARY AND HOSPITAL

- 9:00-12:00. *Orthopedic Surgery* Rounds. End-Result Conference. ALAN DE FOREST SMITH. (7th Fl. Assembly Rm.—Capacity 30)
- Low Back Pain and Herniation of the Nucleus Pulposus. ALAN DE FOREST SMITH. (Same Rm.)
- Suppurative Arthritis. HALFORD HALLOCK. (Same Rm.)
- 1:30-4:00. *Orthopedic Surgery* General Orthopedic Clinic. LEONIDAS A. LANTOUMIS and STAFF. (Same Rm.)
- Scoliosis Clinic. WILLIAM VON LOCKUM. (Same Rm.)

NEW YORK POST-GRADUATE MEDICAL SCHOOL AND HOSPITAL

- 8:30-11:30. *Urology* Operative Clinic. CLARENCE BAWDLER. (O.R. 5—Capacity 10)
- 8:30-12:00. *Plastic Surgery* Operative Clinic. GUSTAVE AUFRICHT. (O.R. 3—Capacity 10)
- 10:30-12:30. *Neurosurgery* Nonoperative Clinic: Case Presentations of Thoracolumbar Sympathectomy for Essential Hypertension. JEROME W. LORD JR., S. ARTHUR LOCALIO. (Erdmann Auditorium—Capacity 125)
- 11:30-1:00. *Oral Surgery* Operative Clinic. F. S. DUNN. (O.R. 5—Capacity 10)
- 1:00-5:00. *Thoracic Surgery* Operative Clinic. L. R. DAVIDSON. (O.R. 4—Capacity 10)
- 1:00-5:00. *General Surgery* Operative Clinic. R. F. CARTER. (O.R. 5—Cap. 10)
- 1:00-5:00. *Gynecology* Operative Clinic. W. T. DANN REUTHER. (Surg. Amphitheatre—Capacity 50)

PRESBYTERIAN HOSPITAL

- 8:00-12:00. *General Surgery* Operative Clinics: Thoracic Surgery. GEORGE H. HUMPHREYS, HERBERT C. MAIER, RICHMOND L. MOORE. (Balcony Fl. 19, Main O.R. C-F—Capacity each 16)
- Thyroid Surgery. WILLIAM B. PARSONS, LAWRENCE W. SLOAN, ROBERT H. E. ELLIOTT. (Same Rm.)
- 8:00-12:00. *Plastic Surgery* Operative Clinics
- Plastic Operations. JEROME P. WEBSTER. (Balcony Fl. 19, Main O.R. G and H—Capacity each 16)
- Release of Burn Contracture of the Neck. THOMAS W. STEVENSON. (Same Rm.)
- 1:00-4:00. *General Surgery* Nonoperative Clinic: Surgical Treatment of Esophageal Neoplasms. GEORGE H. HUMPHREYS. (Amphitheatre A, Main Fl. Phys. and Surg. Bldg.—Capacity 235)
- The Surgical Treatment of Bronchiectasis. RICHMOND L. MOORE. (Same Rm.)
- Mediastinal Tumors. HERBERT C. MAIER. (Same Rm.)
- Thoracoabdominal Injuries. ROBERT H. WYLIE. (Same Rm.)
- Surgery of Tumors of the Ampulla of Vater and Head of Pancreas. WILLIAM B. PARSONS. (Same Rm.)
- Results of Partial Gastrectomy for Peptic Ulcer. HAROLD D. HARVEY. (Same Rm.)
- 1:00-4:00. *General Surgery* Nonoperative Clinics: Experiences with Anticoagulants in the Treatment of Thromboembolism. DAVID V. HABIB. (McCosh Amphitheatre 18th Fl.—Capacity 142)

Follow-up Results in Thyroid Operations. LAWRENCE W. STOKES (Same Rm.)

Physiological Studies in Injuries Due to Cold. OCTA C. LEROY (Same Rm.)

200-400. *Plastic Surgery Nonoperative Clinic:* Cases of Mammoplasty with Nipple and Areola Transplantation. Plastic Repair after Excision of Carcinoma. Plastic Repair after Extensive Burns. Plastic Repair of Miscellaneous Conditions. JEROME P. WENSTER. (Rm. 4 7 16th Fl. Phys. and Surg. Bldg.—Capacity 60)

Synovitis of the Wrist. Surgical Repair of X-Ray Burns. THOMAS W. STEVENSON (Same Rm.)

PRESBYTERIAN HOSPITAL BABIES HOSPITAL

9:00-11:00. *General Surgery Operative Clinic.* EDWARD J. DONOVAN and STAFF (O.R. and 2, 9th Fl.—Capacity each 5)

1 100-1 200. *General Surgery Nonoperative Clinic:* Presentation of Current Cases. (Ward Rounds—Capacity 10)

200-400. *General Surgery Nonoperative Clinic:* Congenital Hypertrophic Pyloric Stenosis. Report of 600 Consecutive Cases with Follow-up. EDWARD J. DONOVAN (Amphitheater 4th Fl.—Capacity 75)
Splenectomy in Children with Observations on Portocaval Anastomosis. LOUIS M. ROUSSELLOTT (Same Rm.)
Duplications of the Alimentary Tract. Report of Seven Cases with Follow-up. THOMAS V. SANTUCCI (Same Rm.)
Intussusception. BREYER M. HODG. (Same Rm.)

PRESBYTERIAN HOSPITAL NEUROLOGICAL INSTITUTE

9:00-11:00. *Neurosurgery Operative Clinic:* Cases Previously Shown Clinically. 1 the Monday Morning Staff Conference. Surgical Staff (10th Fl. N.L.—O.R.—Capacity 2, O.R. 2—Capacity 6) Clinical Preview of Surgical Cases to be Operated Upon Wednesday Thursday and Friday Mornings. Guests Welcomed.

1 30-1:00. Luncheon—Bard Hall.

200-400. *Neurosurgery Nonoperative Clinic:* Summary Presentations of Current Research Projects. (2nd Fl. Conference Rm.—Capacity 60)

Experimental Production of Acute Disseminated Encephalomyelitis in Monkeys. ELVIN KARAT, ARTHUR WOLFF

Experimental Studies of the Function of the Pyramidal System in Monkeys. FRED MATTIOLI

Localization of Level Lesions of the Spinal Cord by Electromyography. PAUL F. A. HOKKER

Results of Treatment of Nonobstructive Hydrocephalus. Five-year Follow-up. JAMES E. SCARRY

Premature Synostosis of the Sutures of the Cranial Vault—Treatment and Results. LESTER A. MOYER

Incidence of Convulsions Following Depressed Fractures of the Skull. A Follow-up Study. FRED CRAMER

Surgical Procedures Directed to the Relief of Involuntary Mass Reflexes in Paraplegic Patients. J. LAWRENCE POOL

Congenital Dermal Sinuses Subdural Abscess; Abscess of Spinal Cord. LESTER A. MOYER

Anomalous Pachionian Granulations as a Factor in Certain Types of Focal Epilepsy. Case Reports. JAMES E. SCARRY

Therapeutic Applications of Curare Derivatives in Neurology—Motion Pictures. EDWARD B. SCHLESINGER

4 30-5:00. Refreshments.

PRESBYTERIAN HOSPITAL SLOANE HOSPITAL FOR WOMEN

1 100- 200. *Obstetrics and Gynecology.* Nonoperative and/or Operative Clinic: Demonstration of Delivery Room Techniques and Teaching. Demonstration of Operative Obstetrics if Cases Available. CHARLES STEIN, ANTHONY D'EAONO, HOWARD C. MOLOY (7th Fl. Clinic or O.R. or Lecture Rm.—Capacity 20)

200-300. *Obstetrics and Gynecology.* Nonoperative Clinic: Late Results in Cesarean Section. ANTHONY D'EAONO. (7th Fl. Lecture Rm.—Capacity 40)

300-400. *Obstetrics and Gynecology.* Nonoperative Clinic: Use of Stereocentgenograms in the Diagnosis of Pelvic Types. HOWARD C. MOLOY (Same Rm.)

400-500. *Obstetrics and Gynecology.* Nonoperative Clinic: Relation of Size of Fetal Head to Pelvic Inlet as Identified by Stereocentgenograms. CHARLES STEIN. (Same Rm.)

PRESBYTERIAN NEW YORK ORTHOPEDIC HOSPITALS

Fracture Service

9:00-12:00. *Fractures and Traumatic Surgery.* Operative Clinic. FRACTURE SERVICE STAFF (Fresh Hop. Balcony, 9th Fl. Main O.R.—Capacity 8)

1200-400. *Orthopedic Surgery.* Nonoperative Clinic: Fracture Follow-up Clinic. FRACTURE SERVICE STAFF. (Rm. 237, 3rd Fl. Vanderbilt Clinic—Capacity 20)

400-500. *Orthopedic Surgery.* Nonoperative Clinic: X-Ray Review. FRACTURE SERVICE STAFF (X-ray Rm. 75, Main Fl. Fresh Hop.—Capacity 36)

ROOSEVELT HOSPITAL

200-400. *General Surgery.* Nonoperative Clinic: Surgical Treatment of Lesions of the Colon.

The Management of Polyps and Papillomas of the Rectum. FREDERICK H. ANDERSON. (Conference Rm. 1—Capacity 20)

Pathology of Ulcerative Colitis. Gross and Microscopic Specimens (Illustrative Lantern Slides). WALTER W. BRANTNER. (Same Rm.)

ST LUKE'S HOSPITAL

8:30- 200. *General Surgery.* Operative Clinic. WILLIAM MACFEE and STAFF (Lyle O.R.—Capacity 20)

200-400. *General Surgery.* Nonoperative Clinic: Clinical Demonstrations. Unusual Aspects of Otherwise "Incurable" Tumors. FRANKIE CARTER WOOD. (Staff Conference Rm.—Capacity 60)

Carcinoma of Breast, Ten-year Follow-up. BENJAMIN SCHWARTZ. (Same Rm.)

1 100-200. *Otolaryngology.* Operative Clinic: Operative Clinic and Clinical Demonstrations. WILSON FORTKES and STAFF (Lyle O.R.—Capacity 6)

ST VINCENT'S HOSPITAL

9:00- 200. *General Surgery.* Operative Clinic: General Surgery. CONSTANTINE J. MACUTER, CLARENCE F. HOWLEY, LOUIS SURGAK. (O.R. A—Capacity 12)

9:00-1200. *General Surgery.* Operative and Nonoperative Clinic: Surgery of the Large Bowel. FRANK X. THOMAS, G. E. BRIDLEY, M. R. DEODINE. (O.R. C—Capacity 20)

9:00- 200. *Pathology.* Nonoperative Clinic: Report on Study of the Question of Retrolymphatic Spread in Carcinoma of the Rectum. J. F. COONELL. (O.R. D—Capacity 20)

9:00- 200. *Genitourinary Surgery.* Nonoperative Clinic: Case Presentation. Diagnosis and Surgical Diseases of the Kidney. THOMAS F. HAWLEY, J. EDWIN DUFFY (Nurse's Lecture Rm.—Capacity 60)

- 2:00-3:00. *Plastic Surgery* Nonoperative Clinic: Round Table Discussion Cleft Lip and Palate. Syndactylism. Skin Grafting of Burns. Postoperative Results and Presentation of Patients. WALTER A. COAKLEY ROBERT H. CLIFFORD (Same Rm.)
- 2:00-4:00. *Otolaryngology* Operative Clinic and Demonstration Oral and Laryngeal Malignancies and Non-Malignancies. JOHN M. LOKE and ASSOCIATES. (O.R. D.—Capacity 10)
- 2:00-4:00. *Pathology* Nonoperative Clinic: Display and Demonstration System Diseases by Kodachrome Slides. ANTHONY ROTTINO and ASSOCIATES. (Nurse's Home, Lab.—Capacity 30)
- 2:00-4:00. *Neurosurgery* Nonoperative Clinic: Surgical Treatment of Tuberculoma of the Brain Supplemented with Streptomycin. T. Q. GARVEY JR. (Nurse's Lecture Rm.—Capacity 60)
- Morphology of the Oligodendroglia Demonstrated by a New Method. ANTONIO GRIMO. (Same Rm.)

U. S. MARINE HOSPITAL (STATEN ISLAND)

- 10:00-12:30. *Orthopedic Surgery* Nonoperative Clinic. A. A. MICHELLE and STAFF
- Fracture of Olecranon (Doctor's Staff Rm.—Capacity 75)
- Fracture of Patella. Discussion and Presentation of Cases. (Same Rm.)
- Treatment of Injuries First Metacarpal-carpal Joint. (Same Rm.)
- Trepaine Vertebral Body (Same Rm.)
- 9:00-12:30. *Thoracic Surgery* Operative Clinics First Stage Thoracoplasty Under Balanced Anesthesia. Pneumonectomy H. L. SKINNER, R. K. IVERSON L. R. DAVIDSON (General O.R.—Capacity 20)
- 12:30-1:30. Luncheon at the Hospital.
- 1:00-3:00. *General Surgery* Nonoperative Clinic: Surgical Ward Rounds. W. F. NICKEL and RESIDENT STAFF (Surg. Wards 3rd & 4th Fl.—Capacity 75)
- 1:00-3:00. *Orthopedic Surgery* Operative Clinic: Iliac Graft Non-union of Tibia. A. A. MICHELLE and STAFF (General O.R.—Capacity 10)
- 2:00-4:00. *Thoracic Surgery* Nonoperative Clinics Echinococcal Cyst. Discussion and Case Presentation. Chest Conference. R. K. IVERSON (Doctor's Staff Rm.—Capacity 75)
- 2:30-4:00. *Anesthesiology* Nonoperative Clinic Intravenous Proximal Therapy for Palatal Orthopedic Condition. H. L. HERBERT and STAFF (General O.R.—Capacity 5)

VETERANS ADMINISTRATION HOSPITAL

- 9:00-12:00. *General Surgery* Operative Clinics. DAVID K. PINKES, EDWIN SELF JOHN E. SULLIVAN (Bldg. D 2 Rm., 12th Fl.—Capacity 20)
- 9:00-12:00. *Genitourinary Surgery* Operative Clinic. LOUIS SWACK, PERRIN SWIDEN, WILLET F. WHITMORE. (Bldg. D 1 Rm., 12th Fl.—Capacity 10)

- 9:00-12:00. *Plastic Surgery* Operative Clinic. HERBERT CONWAY ROBERT H. CLIFFORD (Bldg. B 1 Rm., 5th Fl.—Capacity 10)
- 9:00-12:00. *Radiology* Radiotherapy of Head and Neck. RALPH E. HENDERSON BERNARD ROSWIT (Bldg. C, Ground Fl.—Capacity 50)
- 9:00-12:00. *Otolaryngology* Operative Clinic. SYL VENTER DALY (Bldg. B 5th Fl.—Capacity 5)
- 9:30-11:30. *General Surgery* Nonoperative Clinic Medical Rehabilitation Clinic. HARRY KESSLER, EARL HARFUDER, IRWIN D. STEIN BERNARD STOLL, JACOB BYER. (Bldgs. B-C F Ground Fl.—Capacity 20)
- 11:00-12:30. *General Surgery* Nonoperative Clinic: Results of Operation for Carcinoma of the Rectum. DAVID K. PINKES. (Bldg. A, Ground Fl.—Capacity 300)
- 1:30-3:30. *General Surgery* Nonoperative Clinic: Conference Tumor Board. FRED STEWART P. K. SAUER, ERNEST S. OLSON BERNARD ROSWIT BERNARD STRAUSS, R. L. LA CANOVA, and RESIDENT STAFF (Bldg. A, 3rd Fl.—Capacity 300)
- 3:30-5:00. *Pathology* Nonoperative Clinic Conference Biopsies. FRED STEWART (Same Rm.)
- Scintillation to Rh-sub group. Case Report. ERNEST S. OLSON (Same Rm.)
- Results of Streptomycin in Tuberculosis of the Kidney MORRIS RAKETEM (Same Rm.)
- Hemoglobinuric Nephrosis. ARTHUR C. ALLEN (Same Rm.)
- Carcinoma of Islands of Langerhans Treated with Alloxan. BENJAMIN S. GORDON (Same Rm.)

EXHIBITS (Bldg. A, 3rd Fl.)

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| Anesthesia Section | Results of Vagus Resection |
| Brochogenic Carcinoma | Pathology Section |
| Review of 600 Cases | Medical Illustrations |
| Intracranial Neoplasms | Laboratory |
| Residency Training Program | Plastic Surgery |
| Organization of Surgical Division | Prosthetic Appliances |

WOMAN'S HOSPITAL

- 8:30-12:30. *Obstetrics and Gynecology* Nonoperative Clinics ALBERT ALDRIDGE and STAFF
- Treatment of Neoplasms of the Female Genital Tract. Management of Birth Injuries and Uterine Displacements. (4th Fl. Conference Rm.—Capacity 75)
- Diagnosis and Treatment of Obstetric Complications. End Results of Treatment of These Conditions Will Be Discussed. (Same Rm.)
- During the course of the morning the routine for training of Residents in Gynecology and Obstetrics will be outlined. (Same Rm.)
- The pathologist will give demonstrations of obstetric and gynecologic pathological specimens. (Same Rm.)

CLINICS IN BROOKLYN—LONG ISLAND HOSPITALS

Tuesday

CUMBERLAND HOSPITAL

- 9:00-12:00. *Gynecology* Operative Clinic Gynecological Operations. SAMUEL LUBIN and STAFF (O.R. 1 & 2—Capacity 20)
- Preoperative and Postoperative Care of Gynecological Patients. CHARLES N. LOUGHRAN and STAFF (Same Rm.)

- 10:30-11:00. *Gynecology* Nonoperative Clinic Granuloma Inguinale (Venereum) of Uterus—Follow up. SILEX H. POLAYZ. (Auditorium—Capacity 300)
- 2:00-4:30. *General Surgery* Nonoperative Clinic Immunization with A & B Factors in Erythroblastosis Fetalis SILEX H. POLAYZ. (Same Rm.)

Importance of Blood and Blood Derivatives in Obstetrics. **LESLIE H. THORALL**. (Same Rm.)
 Conservative Management of Abortions. **RICHARD WALTMAN**. (Same Rm.)
 Bacillus Welchii Postpartum Infection, Late Results. **CHARLES LOUGHRAN**. (Same Rm.)

JEWISH HOSPITAL

8:00-10:00. *General Surgery* Operative Clinics. **LOUIS BERGER** and STAFF. (Main O.R. Amphitheatre 1 & 2. Capacity each 35)
 10:00-12:00. *General Surgery* Nonoperative Clinic: Fascial Transplants in Repair of Large Inguinal Hernia. **LOUIS J. MORSE**, **JACOB S. BARR**. (Auditorium—Capacity 200)
 Bacillus welchii Infections of the Biliary Tract. (Same Rm.)
 The Perforated Gall Bladder. **BERNARD PETER**. (Same Rm.)
 Pitfalls in the Diagnosing and Surgical Therapy of Obstructive Jaundice. **HYMAN L. HERSHMAN**, PA & ASSOCIATES. (Same Rm.)
 Experiences with Resection of the Vagus Nerve in the Treatment of Peptic Ulcer. **THEODORE ARNETT**. (Same Rm.)
 Bowel Perforation with Miller Abbott Tube. **SAMUEL ACORN**. (Same Rm.)
 Carcinoma of the Small Bowel. **DAVID FARRER**. (Same Rm.)
 Delayed Verrus Immediate Intestinal Anastomosis. **LOUIS VERRIER**. (Same Rm.)
 Surgical Indications in Chronic Ulcerative Colitis. **RALPH WOLFE**. (Same Rm.)

KINGS COUNTY HOSPITAL

8:30-10:00. *Obstetrics and Gynecology* Operative Clinics (Long Island College Service). **CHARLES A. GORDON**, **M. GLASS**, **W. S. MCGREGOR** and **F. P. LIGHT**. (B. Bldg. O.R. 6—Capacity 5)
 9:30-10:00. *General Surgery* Operative Clinic: Operation for Carcinoma of the Colon. **BENJAMIN CISEL** and STAFF. (Same Rm.)
 9:30-10:00. *General Surgery* Operative Clinics: Subdiaphragmatic Vagus Neurectomy. **GEORGE G. DIXON** and STAFF. (Same Rm.)
 10:00-12:00. *General Surgery* Nonoperative Clinic.
 End-Result of Resection of the Head of the Pancreas in Carcinoma. **BENJAMIN CISEL** and STAFF. (O.P.D. Bldg. Lecture Rm.—Capacity 100)
 End-Result of Embolization of the External Iliac Artery. (Same Rm.)
 Follow-up on Repair of Arteriovenous Fistula. **BENJAMIN CISEL** and STAFF. (O.P.D. Bldg. Lecture Rm.—Capacity 100)
 Follow-up on Unusual Results With Internal Fixation for Fracture of Femoral Neck. **BENJAMIN CISEL** and STAFF. (Same Rm.)
 10:00-12:00. *General Surgery* Nonoperative Clinic.
 Report on a Series of Vagus Neurectomies.

Gastroscopy and Gastric Surgery. (RICHARD SCHWARTZ by request). (Main Bldg. Rm. B-3—Capacity 50)
 Replacement Therapy by Massive Transfusions in Gastrointestinal Hemorrhage. (VICTOR GOSSEN by request). (Same Rm.)

12:00-1:00. *Obstetrics and Gynecology* Nonoperative Clinic: Gynecology. (Main Bldg. Lecture Rm. 1st Fl.—Capacity 40)
 1:00-2:00. *Orthopedic Surgery* Nonoperative Clinic: **JOSEPH B. L'ETECOCORE** and STAFF. (Main Bldg. Board Rm.—Capacity 50)
 Follow-up on Hip Bone Blocks for Painful Hips in Adults. Presentation of Cases.
 Secondary Joint Changes Following Burns. (Same Rm.)
 Tuberculosis of the Greater Trochanter of the Femur. Follow-up Study. Complications. Presentation of Cases. (Same Rm.)
 Abduction Hip Splint for Congenital Dislocation of the Hip. Occipitocervicothoracic Fusion. Four-year Follow-up on an Unusual Case of Cervical Pott's Disease Complicated by Paraplegia. (Same Rm.)

LONG ISLAND COLLEGE HOSPITAL

9:00-10:00. *Obstetrics and Gynecology* Operative and Nonoperative Clinics. Clinics and Demonstrations. Members of the Staff. (Surg. Amphitheater—Capacity 100)
 10:00-11:00. *General Surgery* Operative Clinic: Operative Clinics, Demonstrations, Cases and End-Results. **FRED SCHWARTZ** and STAFF. (Same Rm.)

METHODIST HOSPITAL

8:00-10:00. *General Surgery* Operative Clinic. **HAROLD K. BILL**, **SEYMOUR G. CLARK** and STAFF. (Main O.R. 6—Capacity 5)
 8:00-10:00. *Orthopedic Surgery* Operative Clinic. **HENRY P. LAWRE** and STAFF. (Main O.R. Orthopedic Rm.—Capacity 5)
 10:00-12:00. Lunches at the Hospital.
 10:00-12:00. *General Surgery* Nonoperative Clinic: Symposium on Gastric and Duodenal Surgery. **ELMER F. GRAHAM**, Moderator.
 The Peptic Ulcer Problem. **H. K. BILL**. (Nurse's Auditorium—Capacity 300)
 The Value of X Ray in Diagnosis of Peptic Ulcer. **G. W. CHASE**. (Same Rm.)
 The Value of the Gastroscopy in Diagnosis of Peptic Ulcer. **E. A. SUMNER**. (Same Rm.)
 Primary Carcinoma of the Duodenum. **P. A. REIDEN**. (Same Rm.)
 Preoperative and Postoperative Care. **M. HOBBS**. (Same Rm.)
 Our Experience with Subtotal Gastrectomy. **S. G. CLARK**. (Same Rm.)
 Vagotomy for Peptic Ulcer. **E. H. GRIFFIN**. (Same Rm.)
 Report of Unusual Cases. **J. A. THOM**. (Same Rm.)
 Demonstration of Pathology. **J. HORN**. (Same Rm.)
 Demonstration of X Rays. **G. W. CHASE**. (Same Rm.)

CLINICS IN NEW YORK HOSPITALS

Wednesday

BABIES HOSPITAL
 (See Presbyterian Hospital)
 BEEKMAN DOWNTOWN HOSPITAL
 9:30-11:00. *Traumatic Surgery* Nonoperative Clinic.
 Ward Fracture Rounds. **ROBERT H. KROGER** and STAFF. (Wards. Total Capacity 30. In groups 5-6)

11:00-12:00. *Traumatic Surgery* Nonoperative Clinic.
 Sensory Denervation of the Heel for Persistent Pain Due to Old Calcaneal Fracture. **MYRON A. SALLICK**. (2nd Fl. Annex. Capacity 50)
 Indications for Myotomy in Flexor Tendon Injuries.
 LINTNER BLOW. (Same Rm.)

Abdominal Puncture as a Diagnostic Aid in the Acute Abdomen. **STURMUND MAGEE**. (Same Rm.)
General Discussion of Patients Seen on Rounds. **ROBERT H. KENNEDY and STAFF**. (Same Rm.)

BELLEVUE HOSPITAL—FIRST (COLUMBIA UNIVERSITY) SURGICAL DIVISION

8:00—12:00. *Thoracic Surgery* Operative Clinic. **FRANK B. BERRY and STAFF**. (O. R. C & D 5th Fl.—Capacity 10)

BELLEVUE HOSPITAL—SECOND (CORNELL UNIVERSITY) SURGICAL DIVISION

8:30—10:30. *General Surgery* Operative Clinics. **GUILFORD S. DUDLEY and STAFF**. (K & O. R.—Capacity 5)

Abdominopelvic Resection for Carcinoma of Rectosigmoid. **GUILFORD S. DUDLEY**. (O. R. A)

Split Thickness Skin Graft to Arm. **CARLETON CORNELL**. (O. R. B.—Capacity 5)

Subtotal Gastrectomy for Peptic Ulcer. **CRANSTON HOLMAN**. (O. R. C.—Capacity 5)

Thoracolumbar Sympathectomy. **ERNEST W. LAMPE**. (O. R. D.—Capacity 5)

10:30—12:00. *General Surgery* Nonoperative Clinics (C & D Amph.—Capacity 100)

Report on a Series of Esophagogastronomy Cases. **LAURENCE MISCALL**

Report on 17 Cases of Richter's Hernia. **DAVID LYTAL, RAYMOND LUOMAMEN**

Report on 120 Cases of Internal Fixation of Fractures of Neck of Femur. **RAYMOND LUOMAMEN, JOHN PRODDEN**

Split Thickness Grafts in General Surgery. **CARLETON CORNELL**

Report on a Series of Peptic Ulcer Perforations. **S. W. MOORE, ROBERT HENDRICKS**

Report on a Series of 7 Cases of Gastrojejunal Colic Fistula. **HERBERT REIKERT**

12:00—4:30. *Genitourinary Surgery* Operative and Non-operative Clinic. **ROBERT HORTCHINS and HOWARD JACK G. W. DRAVER and GEORGE SLAUGHTER**

GUSTAV HUMPHREYS and JOSEPH REIKERT DEAN MAKOWSKI. (K-6 O. R. Capacity 5)

BELLEVUE HOSPITAL—THIRD (NEW YORK UNIVERSITY) SURGICAL DIVISION

8:00—12:00. *Anesthesia* Operative Clinic. **Anesthesia in Thoracic Surgery**. **E. A. ROVERGONE and STAFF**. (8th Fl. C & D O. R.—Capacity 5)

12:00—5:00. *General* Nonoperative Clinic. **Demonstration Rehabilitation and Physical Medicine for Hemiplegia, Rehabilitation Programs for Hemiplegic Patients**. **GEORGE DRAVER**. (Wards F & G-3, 3rd Fl. F & G Bldg.—Capacity 15)

BETH ISRAEL HOSPITAL

9:00—12:00. *Neurosurgery* Operative Clinic. **SMOXY GROSS and STAFF**. (Neurosurgical O. R. 12th Fl.—Capacity 6)

12:00—5:00. *General Surgery* Operative Clinic. **LEON GINSBURG, SAMUEL STANDARD and STAFF**. (Main O. R., 12th Fl.—Capacity 36)

12:00—5:00. *Bacteriology and Serology* Nonoperative Clinic. **Penicillin and Streptomycin**. **ERICK SELIGMAN**. (3rd Fl., Lecture Rm.—Capacity 30)

FLOWER AND FIFTH AVENUE HOSPITALS

9:00—10:00. *General Surgery* Operative Clinic. **A New Operation for Pilonidal Cyst**. **JOHN HERRLIM**. (Main O. R. 8th Fl.—Capacity 15)

Nonoperative Clinic: Preoperative and Postoperative Care. **LOUIS R. KAUFMAN, JAMES M. WINTZELD and STAFF**. (Auditorium—Capacity 300)

10:00—12:00. *General Surgery* Nonoperative Clinic. **Test for Viability of Bowel**. **JOHN HERRLIM, KURT LAURET, S. THOMAS GLASSER**

Nonoperative Clinic: Intestinal Obstruction. **ROBERT T. CROWLEY**. (Auditorium—Capacity 300)

12:00—4:00. *Orthopedic Surgery* Nonoperative Clinics. **Orthopedic Surgery**. **ANNON H. BUCHANAN**. (Same Rm.)

12:00—4:00. *Fractures* Nonoperative Clinic. **Fracture Treatment—Motion Pictures and End Results—Demonstrations**. **MILTON J. WILSON and STAFF**. (Same Rm.)

12:00—4:00. *Plastic Surgery* Operative Clinic. **Plastic Surgery (Strabismus)**. **DAVID M. MAYER, CLARENCE R. STRAATMAN, JOHN F. FORD**. (Main O. R. 8th Fl.—Capacity 15)

Nonoperative Clinic: End Results. **DAVID M. MAYER, CLARENCE R. STRAATMAN, JOHN F. FORD**. (Nurse's Lecture Rm. 8th Fl.—Capacity 25)

12:00—4:00. *Urology* Nonoperative Clinic. **Teaching Exhibit in Outpatient Department**. **SPRAGUE CARLETON and STAFF**. (O. P. D. 10th St. Entrance—Capacity 25)

Nonoperative Clinic: McGregor Orchiectomy. **L. P. WERNER**. (Room A-41—Capacity 18)

GOLDWATER MEMORIAL HOSPITAL—THIRD SURGICAL DIVISION

9:00—10:00. *General Surgery* Operative Clinic. **HOWARD BARBER and STAFF**. (Adm. Bldg. Main O. R. 3rd Fl.—Capacity 30)

9:00—11:30. *Geriatric Surgery* Nonoperative Clinics. **Refrigeration in Clinical Surgery**. **W. F. RUGGERS**

Primary Closure in Amputations of Lower Extremity. **M. J. TOMAS**

Herniorrhaphy in the Aged. **M. STANLEY BROWN**

Arteriotomy. **NEED SCHENATERRON**

Peritonitis in the Aged. **T. C. CASE**

11:30—12:00. *Geriatric Surgery* Nonoperative Clinic. **Ward Rounds**. (C 21 and 22)

12:00—4:30. *Geriatric Surgery* Nonoperative Clinics. **The Treatment of Varicose Ulcers by Ligation of Femoral Vein**. **LEO KENNEDY**. (North Conference Rm. and Fl. Between C and D Pavilion—Capacity 50)

Pandiculitis in the Aged. **HEINRY DOUGLASS**. (Same Rm.)

Prostatectomy in the Complicated Case. **SAMUEL S. BERENSON**. (Same Rm.)

Interesting Urological Conditions in the Aged. **GEORGE SLAUGHTER**. (Same Rm.)

Intravenous Procaine in Surgery. **MILTON OFFENHEIM**. (Same Rm.)

Arteriography. **EDMOND TORTORA**. (Same Rm.)

Combined Lumbar Sympathectomy and Vein Ligation for Peripheral Vascular Disease. **B. SHAPIROFF**. (Same Rm.)

4:30—5:30. *Geriatric Surgery* Nonoperative Clinic. **Forum on Surgical Investigation by Postgraduate Class of Surgery**. (Same Rm.)

HARLEM EYE AND EAR HOSPITAL

8:00—9:00. *Otolaryngology* Operative Clinic. **Tonsillectomies with Medial tonsil enucleator**. **C. B. MIZNER, E. GLASSBERG and STAFF**. (Tonnal O. R.—Capacity 5)

9:00—10:00. *Ophthalmology and Otorhinolaryngology* Operative Clinic. **Major Eye, Ear, Nose and Throat Surgery**. **A. HEATHINGTON**. (Major O. R.—Capacity 5)

10:00—11:00. *Otorhinolaryngology* Demonstration. **Demonstration of Ear, Nose and Throat Cases**. **C. B. MIZNER and STAFF**. (E. N. T. Clinic—Capacity 20)

- 1200-1300. *Otolaryngology* Operative Clinic—Rhinoplasty Surgical Case. H. SARIM (Major O.R.—Capacity 5)
 1200-2000. *Ophthalmology* Operative Clinic Eye Surgery C. B. MEDOW, P. MULLER (Major O.R.—Capacity 5)

HARLEM HOSPITAL

- 900-1200. *General Surgery* Nonoperative Clinic Symptom on Lymphogranuloma and Rectal Stricture. Ward Rooms. L. T. WARDER, J. G. LEVY and STAFF (Ward 5th Women Pavilion—Capacity 5)
 100-500. *Gynecology* Synopostum. H. C. FAIR, P. M. MURRAY, and STAFF
 Operative Clinic 1. Gynecological Surgery (Gyn. O.R. 4th Fl. Women's Pavilion—Capacity 8)
 Nonoperative Clinics () Management of Postabortal Infection, (b) Management of Recurrent Salpingitis, (c) Management of Pyometra Complicating Fibroid with End Results. (Conference Rm. 4th Fl. Women's Pavilion—Capacity 8)

HOSPITAL FOR JOINT DISEASES

- 900-930. *Orthopedic Surgery* Operative Clinic Nerve Resection for Painful Arthritis of Hip Joint. ISAAC ZADK. (Surg. Amphitheater—Capacity 50)
 930-1200. *Genitourinary Surgery* Operative Clinic Hemorrhoids, Flatula-In-ano Benign Adenoma of Rectum, Pilonidal Cyst. Nonoperative Clinic Lymphogranuloma Venereum. HARRY GOLDMAN. (Small O.R.—Capacity 5)
 1200-1300. *Genitourinary Surgery* Operative Clinic Surgery of the Kidneys, Ureter and Bladder PAUL ASCHMEHL. (Surg. Amphitheater—Capacity 50)

HOSPITAL FOR SPECIAL SURGERY

- 830-1200. *Orthopedic Surgery* Operative Clinic Children's Service. PHILIP D. WILSON and STAFF (Male O.R.—Capacity 5)
 900-1200. *Orthopedic Surgery* Nonoperative Clinic General Surgical Problems. F. BECKMAN, R. V. GRACE, B. L. COLEY and STAFF (Lecture Hall—Capacity 50)
 1200-1300. *General and Plastic Surgery* Nonoperative Clinic. General Surgical Problems and Plastic Surgery F. BECKMAN and STAFF (Same Rm.)

LENOX HILL HOSPITAL

- 900-1200. *General Surgery* Operative Clinic. OTTO C. PICHAARD and STAFF (O.R. and 3—Capacity each 15)
 1200-1300. *General Surgery* Nonoperative Clinic. Experiences in Vagotomy for Peptic Ulcer. JAMES R. DONALDSON (Einhorn Auditorium—Capacity 450)
 1300-1400. *Thoracic Surgery* Nonoperative Clinic Late Results Following Pneumectomy and Lobectomy in Bronchiectasis, Cystic Disease of the Lung and Pulmonary Abscess. HERBERT C. MAYER, WALTER FENCHE. (Same Rm.)

LYING-IN HOSPITAL

(See New York Hospital)

MANHATTAN EYE, EAR AND THROAT HOSPITAL

- 900-1200. *Ophthalmology* Nonoperative Clinic. Demonstration of Anisokonia Clinic. A. LOREZ. (1st Fl. Rear—Capacity 5)
 900-1200. *Ophthalmology* Operative Clinic: Plastic Operations of Eye. BEROM SMITH. (Eye O.R. 6th Fl.—Capacity 5)

- 900-1200. *Otolaryngology* Demonstration. Postoperative Cases. M. F. JONES, R. J. BEHRETT (Jones Clinic and 11—Capacity 24)
 930-1200. *Ophthalmology* Demonstration, Glaucoma Clinic. Late Results of Glaucoma Surgery F. L. P. KOCH. (East Eye Clinic 1st Fl.—Capacity 24)
 1000-1200. *Ophthalmology* Demonstration. Corneal Grafting Technique on Rabbits. H. M. KATZ. (Eye Bank Lab. 10th Fl.—Capacity 5)
 000-1200. *Otolaryngology* Operative Clinic and Demonstration. Operation for Polypoid Sinusitis and Demonstration of Postoperative Cases. A. NICO. (1st Fl. O.R.—Capacity 5)
 100-1200. *Ophthalmology* Demonstration. Corneal Grafting Technique. Corneal Research Laboratory R. T. LAYTON, H. M. KATZ. (Eye Bank Lab. 10th Fl.—Capacity 5)
 120-1200. *Otolaryngology* Bronchoscopic Clinic. Diagnosis and Treatment. D. S. CURWOOD. (Bronche. Clinic 3rd Fl.—Capacity 5)
 1200-1300. *Otolaryngology* Operative Clinic: Frenotomy Operation. M. F. JONES. (O.R. 6th Fl.—Capacity 5)
 1200-1300. *Ophthalmology and Otolaryngology* Demonstration. Allergy in Ophthalmology. Allergy in Otolaryngology. Demonstration of Cases and Testing Technique. A. A. ECKHART, A. B. PAGE. (Conference Rm.—Capacity 50)
 120-1200. *Otolaryngology* Operative Clinic. Tonsil Surgery. WILLIAM H. TURNLEY. (O.R. 7th Fl.—Capacity 5)
 100-1200. *Ophthalmology* Operative Clinic. Cataract Surgery. D. H. WENZEL. (Eye O.R. 6th Fl.—Capacity 5)
 1200-1300. *Ophthalmology* Demonstration. Eye Pathology. Demonstration Microscopic Sections. JOSEPH LAYAL. (Eye Path. and 11—Capacity 50)

MEMORIAL HOSPITAL

- 800-1200. *Tumor Surgery* Operative Clinic. FRANK E. ADAMS, G. E. BOWLEY, B. L. COLEY, A. L. DEAS, V. F. MAXWELL, DAVES MARTIN, GEORGE T. PAGE, G. H. TWOMBLY, W. L. WATSON. (O.R. A—Capacity 5, O.R. B—Capacity 15, O.R. C—Capacity 7, O.R. D—Capacity 7, O.R. E—Capacity 7)
 100-1200. *Tumor Surgery* Nonoperative Clinic. Stages. Kettering Institute. Biochemical Changes in Patients with Cancer
 Altered Steroid Excretion of Patients with Cancer and Other Diseases. K. DOBNER, S. LIEBERMAN (Auditorium—Capacity 450)
 Altered Carbohydrate Metabolism in Patients with Gastric Cancer. N. F. YOUNG, F. HONORBERGER. (Same Rm.)
 The Interpretation of Protein Determinations. M. L. PETERMAN, N. F. YOUNG, K. HONORBERGER. (Same Rm.)
 Altered Protein Metabolism and the Clinical Implications of the Systemic Disorder in Patients with Gastric Cancer. F. HONORBERGER, N. F. YOUNG, E. C. KETTERING JR. (Same Rm.)
 The Modern Orientation of Clinical Cancer Research: A Discussion of the Preceding Papers. C. P. RUSSELL. (Same Rm.)
 Revised Hayes Martin Clinic. (Same Rm.)
 Castration in Carcinoma of Male Breast. N. E. TAYLOR. (Same Rm.)
 120-1300. *Tumor Surgery* Nonoperative Clinic: Follow up Clinics in Cancer of the Uterus. G. H. TWOMBLY. (Auditorium—Capacity 450)

3:00-4:00. *Tumor Surgery* Nonoperative Clinic. The Conduct of End Results in Early Cancer Detection Clinic. ELIAS L'ESPÉRANCE. (Same Rm.)

METROPOLITAN HOSPITAL

- 9:00-10:00. *General Surgery* Non-Operative Clinic. Intestinal Obstruction. CHARLES A. HALBERSTADT, ROBERT T. CROWLEY (Conference Rm.—Capacity 60)
- 10:00-12:00. *General Surgery* Operative Clinic. Colon Surgery. HAROLD E. CLARK. (Same Rm.) Intestinal Intubation. WALTER L. MEISSENER. (Same Rm.)
- 2:00-4:00. *Thoracic Surgery* Operative Clinic. Value of Cavernostomy in Tuberculosis (2 Operations). SAMUEL A. THOMPSON and STAFF. (Main O.R. 1—Capacity 30)
- 4:00-5:00. *Neurosurgery* Operative Clinic. Nerve Suture Cases. THOMAS I. HOEK, IGOR OLJENICK and STAFF. (Main O.R. 2—Capacity 15)

MONTEFIORE HOSPITAL

- 10:00-12:00. *General Surgery* Nonoperative Clinic. Results of Treatment of Hydrocephalus by Choroid Plexectomy. LEO DAVIDOFF. (Social Hall—Capacity 200)
- 2:00-5:00. *General Surgery* Operative Clinic. LEO DAVIDOFF. (O.R.—Capacity 10)
- 5:00-7:00. *Ophthalmology* Ophthalmological Service. Vitreous Transplantation. S. GARTNER, B. PRITZELT. (Social Hall—Capacity 200)
- Visual Field Studies in Neurosurgery. M. CHAMLER. (Same Rm.)
- Electroretinography. E. BILLET
- Modified Tarsorrhaphy for High Degrees of Exophthalmos. S. GARTNER, M. CHAMLER
- Cataract Surgery in Young Diabetics. A. I. LARSEN.

MOUNT SINAI HOSPITAL

- 8:30-10:00. *Thoracic Surgery* Operative Clinic Operation for Patent Ductus Arteriosus. ARTHUR S. W. TOUROFF. (Surg. Amph.—Capacity 100)
- 10:00-12:00. *Thoracic Surgery* Nonoperative Clinic. Intramuscular Heparin (Concentrated) Therapy in the Prevention of Post-Operative Thrombosis and Embolism. HAROLD NEUBER. (Surg. Amph.—Capacity 100)
- Technique of Operation for Clotted Hemothorax (Motion Picture Demonstration). (Same Rm.)
- Results of Operative Treatment of Traumatic Thoracic Lesions in Civilian Practice. ARTHUR S. W. TOUROFF. (Same Rm.)
- Operative Results in Pediatric Surgery. ERNEST E. ABRAHAM. (Same Rm.)
- Results of Surgical Treatment of Perforation of the Esophagus. EDWARD A. JENKINS. (Same Rm.)
- Results of Conservative Surgical Treatment of Chronic Pulmonary Abscess. IRVING A. SAROT. (Same Rm.)
- Late Results in Pulmonary Resection for Carcinoma of the Lung. (Same Rm.)
- 2:00-5:00. *Ophthalmology* The Surgical Treatment of Glaucoma. JOSEPH LAVAL. (Same Rm.)
- Operative and Nonoperative Clinic. Operated Cases. HENRY MINNEY, JOSEPH LAVAL, DAVID WEXLER. (Same Rm.)

NEW YORK EYE AND EAR INFIRMARY

- 10:00-12:00. *Otolaryngology* Nonoperative Clinic. Frenotomy—Preoperative and Follow-up. J. M. SMITH. (Clinic Rm.—Capacity 20)
- Otolaryngology* Plastic Surgery Preoperative and Follow-up. JAY D. WHITMAN. (Same Rm.)

2:00-5:00. *Otolaryngology* Operative Clinic Frenotomy Operation. J. M. SMITH. (Ear O.R.—Capacity 5)

Otolaryngology Operative Clinic—Plastic Surgery. JAY D. WHITMAN. (Same Rm.)

5:00-7:00. *Ophthalmology* Nonoperative Clinic. Indications for Surgical Interference. W. EDGINGTON and H. ELWYN and ASSOCIATES. (Clinic Rm.—Capacity 30)

The Follow-up on Plastic Surgery with Discussion of Further Steps. W. HUGHES, J. COLE and ASSOCIATES. Operative Clinic. Surgical Demonstration with Emphasis on Cataract and Glaucoma Surgery. C. BEERS and H. ROMANOW and ASSOCIATES. (Eye O.R.—Capacity 10)

X Rays and Localization. IRVING SCHWARTZ. The routine clinics of the New York Eye and Ear Infirmary will be held as usual during this period, all Fellows of the American College of Surgeons are cordially invited to attend.

NEW YORK HOSPITAL

- 9:00-11:30. *Neurosurgery* Nonoperative Clinic Symposium Conducted by BROWN S. RAY. Surgical Relief of Intractable Pain of the Head and Neck. HENRY PARSONS. (Room F-650—Capacity 70)
- Ondiographic Study of Sensory Pathways. Evidence of Bilateral Conduction. CHARLES BERRY, RICHARD KARL, JOSEPH C. HENRY. (Same Rm.)
- Alterations in Visceral Sensation After Thoracolumbar Sympathectomy. CHARLES L. NEILL. (Same Rm.)
- Induced Mechanical Stresses in the Analysis of Headache Mechanisms and the Diagnosis of Intracranial Tumors. E. CHARLES KUNTZ. (Same Rm.)
- Sympathetic Supply to the Lower Extremities. ARTHUR D. CONSOLE. (Same Rm.)
- On the Nature of Hyperalgesia. HAROLD G. WOLFF, JAMES D. HARDY, HELEN GOODKILL. (Same Rm.)
- Intracranial Aneurysms. BRIDGSON S. RAY. (Same Rm.)
- 9:00-12:00. *General Surgery* Operative Clinic. General Surgery. FRANK GLICK and STAFF. (10th Fl. O.R.—Capacity 120)
- Nonoperative Clinics. Follow up Study of Treatment of Peptic Ulcer. WILLIAM A. COOPER. (College Auditorium, Rm. B-601—Capacity 350)
- Bleeding Peptic Ulcer. CHAMBERMAN HOLMAN. (Same Rm.)
- Diagnosis of Stomach Lesions. WILLIAM A. COOPER. (Same Rm.)
- Gastrojejunocolic Fistula. E. COOPER PERSON. (Same Rm.)
- Carcinoma of the Head of the Pancreas. GARDNER CHILD. (Same Rm.)
- Esophagoplastomy—Follow-up of Cases. WILLIAM A. BARRETT. (Same Rm.)
- 2:00-5:00. *Otolaryngology* Operative Clinic. Surgery of the Paranasal Sinuses. SAMUEL F. KELLY. (10th Fl. O.R.—Capacity 30)

NEW YORK HOSPITAL LYING-IN HOSPITAL

- 9:00-12:00. *Obstetrics and Gynecology* Operative Clinics. Tubal Plastic Operation for the Relief of Sterility. J. RANDOLPH GIFFERT. (Gyn. O.R., 2 Rms. Capacity 50)
- Gynecological Operations. R. GORDON DOUGLAS. (Same Rm.)
- Forceps Demonstration. JAMES A. HARRAR. (Same Rm.)
- 2:00-5:00. *Obstetrics and Gynecology* Nonoperative Clinics. Evaluation of Prophylactic Chemotherapy in Cesarean Section. R. GORDON DOUGLAS, ROBERT LAUDERMAN. (Lecture Rm.—Capacity 100)

- Labor and Delivery Following Cesarean Section. ARTHUR WILSON. (Same Rm.)
- Pregnancy Following Salpingostomy J RANDOLPH GUYBERT. (Same Rm.)
- Studies on Pain During Labor CARL T JAVERT JAMES HARDY. (Same Rm.)
- The Conservative Treatment of Endometriosis. ARTHUR V GREELLY. (Same Rm.)
- The Treatment of Massive Hemorrhage. JOHN T COLL. (Same Rm.)
- Vaginal Swears in Early Diagnosis of Carcinoma. GEORGE PAPANTOLOS. (Same Rm.)

NEW YORK ORTHOPEDIC DISPENSARY AND HOSPITAL

- 8 30-100. *Orthopedic Surgery* Operative Clinic. ALAN DE FOREST SMITH and STAFF (O.R. 1 & 2—Capacity 12)
- 30-400. *Orthopedic Surgery* General Orthopedic Clinic. HALFORD HALLOCK and STAFF (7th Floor Assembly Room—Capacity 30).

NEW YORK POST-GRADUATE MEDICAL SCHOOL AND HOSPITAL

- 8 30-300. *Plastic Surgery* Operative Clinic. GUSTAVE AUDINET. (O.R. 2—Capacity 1)
- 30-120. *General Surgery* Nonoperative Clinic Gall Bladder Disease, Common Duct Disord. R. FRANK LEE CARTER. (Erdmann Auditorium—Capacity 25)
- 1 00-500. *General Surgery* Operative Clinic. H. E. CLARK. (O.R. —Capacity 1)
- Operative Clinic C. G. HERR. (Surg. Amph.—Capacity 50)
- 100-500. *Gynecology* Operative Clinic. M. N. HYMAN. (O.R. 5—Capacity 1)

PRESBYTERIAN HOSPITAL

- 8 00-100. *General Surgery* Operative Clinics
- Surgery of the Breast. CURTIS D. HAAGENSEN and STAFF (Balcony FL. 9, Main O.R. D-G—Capacity each 6)
- Surgery of the Stomach. RUDOLPH N SCHULDMYER, EDWARD L. HOWES. (Same Rm.)
- Portacaval Anastomosis. ARTHUR H. BLAKEMORE. (Same FL O.R. C—Capacity 6)
- 1 00-400. *General Surgery* Nonoperative Clinic: Certain Essential Features Suggested by 30 Year Follow-up in Carcinoma of the Breast. HUGH ADAMS-CRAWFORD. (McCook Amph., 8th FL—Capacity 142)
- The Relation of Chronic Cystic Disease to Carcinoma of the Breast. ARTHUR PURDY STOUT. (Same Rm.)
- The Problem of Early Diagnosis in Carcinoma of the Breast. CURTIS D. HAAGENSEN. (Same Rm.)
- Röntgenotherapy of Carcinoma of the Breast in Non-operated Cases and as Preoperative and Postoperative Treatment. MAURICE LEECH. (Same Rm.)
- Surgery Versus Radioth. in Carcinoma of the Breast. CURTIS D. HAAGENSEN. (Same Rm.)

PRESBYTERIAN HOSPITAL BABIES HOSPITAL

- 9 00-100. *General Surgery* Operative Clinic. MICHIGAS OF THE STAFF (O.R. 1 & 2 9th FL—Capacity 5 each)
- 100-200. *General Surgery* Nonoperative Clinic The Surgical Treatment of Cystic Heart Disease. GEORGE H. HONIGSMAN. (Amph. 4th FL—Capacity 15)
- 100-400. *General Surgery* Nonoperative Clinic: Roentgen Findings in Intestinal Obstruction of the New born. JOHN CARTER. (Same Rm.)

- Treatment of Acute Hematogenous Oostomyelitis Comparison of Cases Treated with and without Penicillin Follow-up. EDWARD B. SELBY. (Same Rm.)
- End Results in Operations for Undescended Testicle. EDWARD N. GOODMAN. (Same Rm.)
- Inguinal Hernia in Infancy and Childhood. Indications for Operation in Infancy F. Bow-up. JOHN M. FORD. (Same Rm.)

PRESBYTERIAN HOSPITAL

THE INSTITUTE OF OPHTHALMOLOGY

- 9 00-12 00. *Ophthalmology* Nonoperative Clinic: External Diseases of the Eye. JOHN HUGHES DUNDEE and STAFF (Lecture Rm. 7th FL Eye Inst.—Capacity 40)
- 1 00-4 00. *Ophthalmology* Operative Clinic: Surgery of the Extraocular Muscles and Intracocular Operations JOHN HUGHES DUNDEE and STAFF (O.R. Eye Inst.—Capacity 15)
- Surgical Procedures in Glaucoma and Cataract. ALGER MOY BEVERLY RIDGE and STAFF. (Same Rm.)

PRESBYTERIAN HOSPITAL

SECTION ON OTOLARYNGOLOGY

- 100-200. *Otolaryngology* Nonoperative Clinic: Hearing Aid Fitting. MARY HEDGECOCK. (Rm. 1, 1st FL Vanderbilt Clinic—Capacity 30)
- Fenestration Follow-up. FRANK ALTMAN. (Rm. 124, 1st FL Vanderbilt Clinic—Capacity 30)
- Follow-up of Cases of Bilateral Abductor Paralysis of the Larynx. DEGRAAF WOODMAN. (Same Rm.)
- 30-300. *Otolaryngology* Operative Clinic: Endoscopy GEORGE BRIGHTON. (ENT O.R. A and B—Capacity 6)
- Fenestration. DEGRAAF WOODMAN. (Same Rm.)

PRESBYTERIAN HOSPITAL

SLOANE HOSPITAL FOR WOMEN

- 9 00-10 30. *Obstetrics and Gynecology* Operative Clinic: Repair of Cystocele, Rectocele and Pelvic Floor. B. P. WARREN. (O.R. 7th FL—Capacity 30)
- 100-12 00. *Obstetrics and Gynecology* Operative Clinic: Operation for Vesical Incontinence JOHN H. BOTS. (Same Rm.)
- 100-300. *Obstetrics and Gynecology* Nonoperative Clinic: Surgical Problems in Sterility CHARLES L. BIXTON. (Lecture Rm. 12th FL—Capacity 40)
- 3 00-4 00. *Obstetrics and Gynecology* Nonoperative Clinic: Interpretation of Endometrial Biopsy E. T. LARLE. (Same Rm.)
- 4 00-5 00. *Obstetrics and Gynecology* Nonoperative Clinic: The Possible Carcinogenic Effect of Estrogens S. GUYER. (Same Rm.)

PRESBYTERIAN HOSPITAL

SQUER UROLOGICAL CLINIC

- 9 00-1 00. *Genito-urinary Surgery* Nonoperative Clinic: Sulfonamide Mixtures in the Treatment of Genito-urinary Disease HARRY SANDER. (McCook Amphitheater 8th FL—Capacity 14)
- The Study of the Effect of Streptomycin on Renal Tuberculosis. Preliminary Report. JOHN K. LARSON. (Same Rm.)
- Pathological Classifications of Adrenal Tumors. MARY M. MILLER. (Same Rm.)
- Problems Encountered in the Diagnosis and Treatment of Congenital Anomalies of the Urinary Tract in Infants. JOHN N. ROBINSON CHARLES T. HAZARD. (Same Rm.)

PRELIMINARY PROGRAM—1947 CLINICAL CONGRESS

2:00-4:00. **Genitourinary Surgery** Operative Clinic. Surgical Operations. GEORGE F. CARLIS, GEORGE W. FIAT and STAFF (Main O R 19, Rm. C and D—Capacity 35)
 Exhibit on Cystoscopic Equipment (Rm 310, Hosp. 10th FL—Capacity 35)
 Exhibit of Urological Pathology Department (Rm 310, 15th FL, Phys. & Surg. Bldg—Capacity 35)
PRESBYTERIAN NEW YORK ORTHOPEDIC HOSPITALS

9:00-12:00. **Fractures and Traumatic Surgery** Operative Clinic. FRANK R. STUART, STAFF (Main O R 19th FL—Capacity 8)
 1:30-4:00. **Fractures and Traumatic Surgery** Nonoperative Clinic. Shoulder Girdle Injuries and Recurrent Shoulder Dislocations with Follow up Results. HARRY L. McLAUGHLIN (Rm 417 16th FL, Phys. & Surg. Bldg—Capacity 100)
 Results of Open and Closed Treatment of Pott's Fractures. VERNER H. STURGEON (Same Rm.)

ROOSEVELT HOSPITAL

9:00-12:00. **General Surgery** Operative Clinic. Surgical Treatment of Lesions of the Colon Subtotal Colectomy for Ulcerative Colitis. ROUNDS and STAFF (O R 13)
 12:00-1:00. **Gynecology** Operative Clinic. Gynecology Patients. HARRY W. CARR and STAFF (O R 13)
 1:00-2:00. **General Surgery** Operative Clinic. Cancer of the Breast. Radical Mastectomy. ROUNDS, Presentation of Cases and Illustration of Late Results. WILLIAM C. WHITE and STAFF (O R 13—Total capacity 50)
 2:00-4:00. **Gynecology** Nonoperative Clinic. The Early Results of Malignancies of the Female Pelvic Organs. Results of the Uterus, etc. (Conference Room 1—Capacity 50)

2:00-4:00. **General Surgery** Nonoperative Clinic. Surgical Treatment of Lesions of the Colon Sequelae, Complications and Late Results of the Surgical Treatment of Ulcerative Colitis. (Motion Pictures of Cases of Ileostomy and Colectomy Presentation of Cases Showing Late Results) HARRY W. CARR (Same Rm.)
 The Late Results of Carcinoma of the Thyroid Gland. JAMES F. THOMSON (Same Rm.)
 Presentation of Cases Illustrating Interesting and Unusual Fractures (Illustrations) WILLIAM H. CARR (Same Rm.)
 Nonunion in Fractures of the Femoral Neck, Case Presentations (Illustrations) M. BECKETT HOWARTH (Conference Rm. 2—Capacity 50)

ST LUKE'S HOSPITAL

8:30-1:00. **Genitourinary Surgery** Operative Clinic. Urologic Surgery. GEORGE HOEN and STAFF (Lyle O R—Capacity 15)
 11:00-1:00. **Orthopedic Surgery** Clinical Demonstration Pathological Demonstration of Internal Derangement of Knee Joint with End Results. DAVID BOWEN and STAFF (Staff Conference Rm—Capacity 60)
 Trochanteric Fractures of Femur Treatment and End Results. FRED THOMSON (Same Rm.)
 2:00-4:00. **Genitourinary Surgery** Clinical Demonstrations Follow-up on War Paraplegia. BORIS PETEROFF and STAFF (Same Rm.)

Follow-up on Vocal Neck Obstructions to Abdomino-perineal Resection. JAMES WALSH (Same Rm.)
 Results of Transurethral Resection. GEORGE HOEN (Same Rm.)
 Combined Treatment of Transverse Resection and Radiotherapy of Bladder Tumors. CRAIG COATES (Same Rm.)
 Renal Rickets. ALLEY (Same Rm.)
 Bilateral Hydronephrosis and Hydroureter. GEORGE HOEN (Same Rm.)

ST VINCENT'S HOSPITAL

9:00-12:00. **General Surgery** Operative Clinic. General Surgery. RAYMOND F. SULLIVAN and ASSOCIATES (O R A and B—Capacity 10 each)
 9:00-12:00. **Neurosurgery** Operative and Follow-up Study of the Treatment of Painful Phantom Limb by Removal of Sensory Cortex. C. G. GUTTERERRE (O R C—Capacity 10)
 12:00-1:00. **General Surgery** Operative and Nonoperative Clinics. Surgery of Gastric and Duodenal Ulcer. GEORGE R. STUART, FRANK J. MCGOWAN, J. P. BROCKMAN (O R D—Capacity 10)
 1:00-2:00. **General Surgery** Nonoperative Clinic. Round Table Discussion. Acute Pancreatitis. CONSTANTINE J. MAGUIRE (Nurse's Auditorium—Capacity 150)
 Reconstruction of Common Bile Duct. RAYMOND P. SULLIVAN, JOHN C. MURPHY (Same Rm.)
 Follow-up Report on 100 Cases of Fracture of Both Bones of the Leg. EDWARD V. DRENNER, F. R. EASTON (Same Rm.)
 2:00-4:00. **Pathology** Theme Culture Demonstration of Malignancy. Display of Fresh Pathological Material. Display and Demonstration of System Diseases by histochromic Stains. A. ROTTINO and ASSOCIATES (Nurse's Home Lab—Capacity 50)

SLOWE HOSPITAL FOR WOMEN

(See Presbyterian Hospital)

U. S. MARINE HOSPITAL

(STATEN ISLAND)

10:00-12:00. **General Surgery** Nonoperative Clinics. Reconstruction Surgery of Face Deformities—Traumatic. Discussion and Case Presentation. Reconstruction of Hand—Discussion and Case Presentation (Doctor's Staff Rm.—Capacity 75)
 12:00-1:00. **Obstetrics and Gynecology** Operative and Nonoperative Clinics. Regional Block in Obstetrics. EDWARD C. L. HENNER (GU O R—Capacity 10)
 1:00-2:00. **Obstetrics and Gynecology** Operative Clinics. Luncheon at the Hospital. Hysterectomy. Vaginal Plastic. GEORGE HOEN (Surg. O R—Capacity 50)
 2:00-4:00. **Ophthalmology** Nonoperative Clinic. Injuries of the Eye with Case Presentation. J. B. PERLES and STAFF (Doctor's Staff Rm.—Capacity 75)

VETERANS ADMINISTRATION HOSPITAL

9:00-12:00. **General Surgery** Operative Clinic. JOHN F. SULLIVAN, CARLOS WELLS (Bldg D 2 Rm. 12th FL—Capacity 50)
 9:00-12:00. **Thoracic Surgery** Operative Clinic. RICHMOND MOORE, WALTER CRANDALL, AARON HINDENLITZ (Bldg D 12th FL 1 Rm.—Capacity 10)

Labor and Delivery Following Cesarean Section. ARTHUR WILLSON (Same Rm.)
 Pregnancy Following Salpingostomy J. RANDOLPH CLEVELAND (Same Rm.)
 Studies on Pain During Labor. CARL T. JAVERT, JAMES HARDY (Same Rm.)
 The Conservative Treatment of Endometriosis. ARTHUR V. GREILEY (Same Rm.)
 The Treatment of Massive Hemorrhage. JOHN T. COLE (Same Rm.)
 Vaginal Senars in Early Diagnosis of Carcinoma. GEORGE PAPANICOLAOU (Same Rm.)

NEW YORK ORTHOPEDIC DISPENSARY AND HOSPITAL

- 8:30-10:00. *Orthopedic Surgery* Operative Clinic. ALAN DE FOREST SMITH and STAFF (O.R. 1 & 2—Capacity 12)
 10-12:00. *Orthopedic Surgery* General Orthopedic Clinic. HALLOW HALLLOCK and STAFF (7th Floor Assembly Room—Capacity 30)

NEW YORK POST-GRADUATE MEDICAL SCHOOL AND HOSPITAL

- 8:30-12:00. *Plastic Surgery* Operative Clinic. GUYRAVE AUSTIN (O.R. 2—Capacity 5)
 10-12:00. *General Surgery* Nonoperative Clinic Gall Bladder Disease, Common Duct Disord. R. FRANKLIN CARTER, (Erdmann Auditorium—Capacity 5)
 10-5:00. *General Surgery* Operative Clinic H. F. CLARK (O.R. 1—Capacity 5)
 Operative Clinic. C. G. HAYD (Surg. Amph.—Capacity 30)
 10-5:00. *Gynecology* Operative Clinic. M. N. HARRIS (O.R. 3—Capacity 5)

PRESBYTERIAN HOSPITAL

- 8:00-10:00. *General Surgery* Operative Clinic
 Surgery of the Breast. CURTIS D. HAAGENBOEK and STAFF (Bakony Fl. 9, Main O.R. D-G—Capacity each 6)
 Surgery of the Stomach. RUDOLPH N. SCHULLINGER, EDWARD L. HOWES (Same Rm.)
 Thoracic Anomalies. ARTHUR H. BLANKENHORN (Same Fl. O.R. C—Capacity 16)
 10-4:00. *General Surgery* Nonoperative Clinic Certain Essential Features Suggested by 30 Year Follow-up in Carcinoma of the Breast. HUGH ADCHINSON (McCosh Amph., 8th Fl.—Capacity 145)
 The Relation of Chronic Cystic Disease of the Carcinoma of the Breast. ARTHUR PURDY SPOUT (Same Rm.)
 The Problem of Early Diagnosis in Carcinoma of the Breast. CURTIS D. HAAGENBOEK (Same Rm.)
 Roentgenotherapy of Carcinoma of the Breast in Non-operated Cases and as Preoperative and Postoperative Treatment. MAURICE LERZ (Same Rm.)
 Surgery Versus Radiation in Carcinoma of the Breast. CURTIS D. HAAGENBOEK (Same Rm.)

PRESBYTERIAN HOSPITAL BABIES HOSPITAL

- 9:00-10:00. *General Surgery* Operative Clinic. MEMBERS OF THE STAFF (O.R. 1 & 2, 6th Fl.—Capacity 5 each)
 10-12:00. *General Surgery* Nonoperative Clinic: The Surgical Treatment of Cyanotic Heart Disease. GEORGE H. HUMPHREYS (Amph. 4th Fl.—Capacity 75)
 10-4:00. *General Surgery* Nonoperative Clinic: Roentgen Findings in Intestinal Obstruction of the New born. JOHN CARTER (Same Rm.)

Treatment of Acute Hematogenous Osteomyelitis: Comparison of Cases Treated with and without Penicillin Follow-up. EDWARD B. SELF (Same Rm.)
 End-Results in Operations for Undescended Testis. EDWARD N. GOODMAN (Same Rm.)
 Inguinal Hernia in Infancy and Childhood. Indications for Operation in Infancy Follow-up. JOSE M. FERRER (Same Rm.)

PRESBYTERIAN HOSPITAL

THE INSTITUTE OF OPHTHALMOLOGY

- 9:00-12:00. *Ophthalmology* Nonoperative Clinic: External Diseases of the Eye. JOHN HUGHES DODDINGTON and STAFF (Lecture Rm. 7th Fl. Eye Inst.—Capacity 40)
 10-4:00. *Ophthalmology* Operative Clinic: Surgery of the Extraocular Muscles and Intraocular Operations. JOHN HUGHES DODDINGTON (O.R. Eye Inst.—Capacity 5)
 Surgical Procedures in Glaucoma and Cataract. ALGER MOY BEVERLY REESE and STAFF (Same Rm.)

PRESBYTERIAN HOSPITAL

SECTION ON OTOLARYNGOLOGY

- 10:00-12:00. *Otolaryngology* Nonoperative Clinic: Hoarseness and Flitting. MARY HODGSON (Rm. 213, 1st Fl. Vanderbilt Clinic—Capacity 30)
 Fertilization Follow-up. FRANK ALTMAN (Rm. 213, 1st Fl. Vanderbilt Clinic—Capacity 30)
 Follow-up of Cases of Bilateral Abductor Paralysis of the Larynx. DEBRA WOODMAN (Same Rm.)
 10-5:00. *Otolaryngology* Operative Clinic: Endoscopy. GEORGE BRIDGTON (E.N.T. O.R. A and B—Capacity 6)
 Fertilization. DR. GRAY WOODMAN (Same Rm.)

PRESBYTERIAN HOSPITAL

SLOANE HOSPITAL FOR WOMEN

- 9:00-10:00. *Obstetrics and Gynecology* Operative Clinic: Repair of Cystocele, Rectocele and Pelvic Floor. B. P. WATSON (O.R. 7th Fl.—Capacity 30)
 10:00-12:00. *Obstetrics and Gynecology* Operative Clinic: Operation for Vesical Incontinence. JOHN H. BORN (Same Rm.)
 10-3:00. *Obstetrics and Gynecology* Nonoperative Clinic: Surgical Problems in Sterility. CHARLES L. BROWN (Lecture Rm. 7th Fl.—Capacity 40)
 10-4:00. *Obstetrics and Gynecology* Nonoperative Clinic: Interpretation of Endometrial Biopsy. E. T. FOWLE (Same Rm.)
 4:00-5:00. *Obstetrics and Gynecology* Nonoperative Clinic: The Possible Carcinogenic Effect of Estrogens. S. GREENBERG (Same Rm.)

PRESBYTERIAN HOSPITAL

SOUTHERN UROLOGICAL CLINIC

- 9:00-10:00. *Genitourinary Surgery* Nonoperative Clinic: Sulfonamide Mixtures in the Treatment of Genitourinary Disease. HARRY SCHICK (McCosh Amphitheater 8th Fl.—Capacity 4)
 The Study of the Effect of Streptomycin on Renal Tuberculosis. Preliminary Report. JOHN K. LATTIN (Same Rm.)
 Pathological Classifications of Adrenal Tumors. MILES M. MULLOWN (Same Rm.)
 Problems Encountered in the Diagnosis and Treatment of Congenital Anomalies of the Urinary Tract in Infants. JOHN N. ROBINSON CHARLES T. HARRIS (Same Rm.)

PRELIMINARY PROGRAM—1947 CLINICAL CONGRESS

1200-4200. *Genitourinary Surgery* Operative Clinic: Sur-
gical Operations GEORGE F. CARILL, GEORGE W.
FISKE and STAFF (Balcony Fl. 19 Rm. C and D—
Capacity 32)
Exhibit on Cystoscopic Equipment. (Rm. 1030, Babies
Hosp., 10th Fl.—Capacity 32)
Exhibit of Urological Pathology Department. (Rm. 510,
15th Fl., Phys & Surg Bldg.—Capacity 32)
PRESBYTERIAN NEW YORK ORTHOPEDIC
HOSPITALS

Fracture Service
9:00-12:00. *Fractures and Traumatic Surgery* Operative
Clinic. FRACTURE SERVICE STAFF (Main O.R. 19th
Fl.—Capacity 8)
30-4200. *Fractures and Traumatic Surgery* Nonopera-
tive Clinic. Shoulder Cliff Injuries and Recurrent
Shoulder Dislocations with Follow-up Results. HAR-
VEY L. McLAUGHLIN (Rm. 417 16th Fl. Phys.
& Surg. Bldg.—Capacity 100)
Results of Open and Closed Treatment of Pott's Frac-
tures. BARBARA B. STINEBAUGH (Same Rm.)

ROOSEVELT HOSPITAL

9:00-12:00. *General Surgery* Operative Clinic: Surgical
Treatment of Lesions of the Colon Subtotal Colectomy
for Ulcerative Colitis. Rounds and Demonstration of
Patients. HENRY W. CAVE and STAFF (O.R. 1 & 3
and 4—Capacity 42)
9:00-12:00. *Gynecology* Operative Clinic. Gynecology
THOMAS G. PRIGENT, ARTHUR V. GREELY and STAFF
(O.R. 2—Capacity 14)
9:00-12:00. *Radical Mastectomy* Rounds, Presenta-
tion of Cases and Illustration of Late Results WILLIAM
C. WHITE and STAFF (O.R. 1-4—Total capacity 56)
11:00-12:00. *Gynecology* Nonoperative Clinic. The Early
Results of Malignancies of the Female Pelvic Organs
Prolapse of the Uterus, etc. (Conference Room 1—
Capacity 50)
30-5200. *General Surgery* Nonoperative Clinic: Surgical
Treatment of Lesions of the Colon Sequelae, Complica-
tions and Late Results of the Surgical Treatment of
Ulcerative Colitis (Motion Pictures of Technique of
Ileostomy and Colectomy Presentation of Cases
Showing Late Results) HENRY W. CAVE. (Same Rm.)
The Late Results of Carcinoma of the Thyroid Gland.
JAMES E. THOMPSON. (Same Rm.)
Presentation of Cases Illustrating Interesting and Un-
usual Fractures (Illustrations) WILLIAM H. CASE
8:00. (Same Rm.)
Nonunion of Fractures of the Femoral Neck, Case Presen-
tations (Illustrations) M. BICKERT HOWARTH.
(Conference Rm. 2—Capacity 50)

ST LUKE'S HOSPITAL

8:30-12:00. *Genitourinary Surgery* Operative Clinic.
Urologic Survey GEORGE HOCH and STAFF (Lytle
O.R.—Capacity 15)
11:00-12:00. *Orthopedic Surgery* Clinical Demonstration
Pathological Demonstration of Internal Derangement
of Knee Joint with End Results DAVID BOWWORTH,
EDWARD WINKANT (Staff Conference Rm.—Capacity
60)
Trochanteric Fractures of Femur Treatment and End-
Results FRED THOMPSON (Same Rm.)
300-5200. *Genitourinary Surgery* Clinical Demonstra-
tions. Follow-up on War Paraplegics. BOBIS PETROFF
& flow up on Renal Tumors. JOHN TAYLOR. (Same
Rm.)

Follow-up on Vesical Neck Obstructions to Abdomino-
perineal Resection. JAMES WADDE. (Same Rm.)
Results of Transurethral Resection. GEORGE HOCH
(Presented by C. H. PLACK) (Same Rm.)
Combined Treatment of Transvesical Resection and Ra-
diotherapy of Bladder Tumors E. CRAIG COATES
(Same Rm.)
Renal Rickets. ALLEY (Same Rm.)
Bilateral Hydronephrosis and Hydroureter GEORGE
HOCH. (Same Rm.)

ST VINCENT'S HOSPITAL

9:00-12:00. *General Surgery* Operative Clinic General
Surgery RAYMOND P. SULLIVAN and ASSOCIATES.
(O.R. A and B—Capacity 10 each)
9:00-12:00. *Neurosurgery* Operative Clinic and Follow-up
Study of the Treatment of Painful Phantom Limb
by Removal of Sensory Cortex. C. G. DE GUTTERER
MAGUIRE (O.R. C—Capacity 10)
10:00-12:00. *General Surgery* Operative and Nonoperative
Clinics Surgery of Gastric and Duodenal Ulcer
GEORGE R. STUART FRANK J. MCGOWAN, J. P.
BRUGGIER (O.R. D—Capacity 10)
2:00-4:00. *General Surgery* Acute Pancreatitis. CONSTANTINE
Table Discussion (Nurse's Auditorium—Capacity 150)
J. MAGUIRE (Nurse's Auditorium Duct. RAYMOND P.
Reconstruction of Common Bile Duct. (Same Rm.)
SULLIVAN, JOHN C. MURPHY (Same Rm.)
Follow-up Report on 100 Cases of Fracture of Both
Bones of the Leg. EDWARD V. DENVER E. R.
EASTON (Same Rm.)
2:00-4:00. *Pathology* Tissue Culture Demonstration of
Malignancy Display of Fresh Pathological Material.
Display and Demonstration of System Diseases by
Kodachrome Slides. A. ROTTINO and ASSOCIATES.
(Nurse's Home Lab—Capacity 30)

SLOANE HOSPITAL FOR WOMEN (See Presbyterian Hospital)

U. S. MARINE HOSPITAL (STATEN ISLAND)

10:00-12:00. *General Surgery* Nonoperative Clinics Re-
construction Surgery of Face Deformities—Traumatic
—Discussion and Case Presentation. Reconstruction
Surgery of Hand—Discussion and Case Presentation.
H. L. SKINNER and STAFF with DENTAL STAFF (Doc-
tor's Staff Rm.—Capacity 75)
10:00-12:00. *Obstetrics and Gynecology* Operative and
Nonoperative Clinics. Regional Block in Obstetrics
and Gynecology Film—Caudal Anesthesia. W. B.
EDWARDS, C. L. HERBERT (GU O.R.—Capacity 10)
12:30-1:30. Luncheon at the Hospital.
1:00-4:00. *Obstetrics and Gynecology* Operative Clinics
Vaginal Plastic. Cesarean Section Hysterectomy
EDWARD BULLARD, W. B. EDWARDS. (Surg. O.R.
EF 4—Capacity 30)
2:00-4:00. *Ophthalmology* Nonoperative Clinic Acute
Injuries of the Eye with Case Presentation J. B.
PEZZER and STAFF (Doctor's Staff Rm.—Capacity
75)

VETERANS ADMINISTRATION HOSPITAL

9:00-12:00. *General Surgery* Operative Clinic. JOHN E.
SULLIVAN CARENTE WEEKS. (Bldg. D 2 Rm., 12th
Fl.—Capacity 30)
9:00-12:00. *Thoracic Surgery* Operative Clinic. RICHMOND
MOORE, WALTER CRADALL, AARON HINDENSTEIN
(Bldg. D 12th Fl., 1 Rm.—Capacity 10)

CLINICS IN NEW YORK HOSPITALS

Thursday

BABIES HOSPITAL
(See Presbyterian Hospital)BELLEVUE HOSPITAL—FIRST
(COLUMBIA UNIVERSITY) SURGICAL DIVISION8:00-10:00. *Thoracic Surgery* Operative Clinic. FRANK B. BERRY and STAFF (C & D Bldg. 5th Fl.—Capacity 1)10:00-12:00. *Thoracic Surgery* Nonoperative Clinic. FRANK B. BERRY and STAFF (C & D Bldg. Stewart Amph.—Capacity 50)

Suppurative Diseases of the Lung. WALTER B. CRANDALL. Cardiopulmonary Physiology. RICHARD RILEY. A. ROX. HUMMELSTEIN

Surgery of Tuberculosis. JOHN MAXWELL CHAMBERLAIN. Surgical Treatment of Chronic Spontaneous Pneumothorax. HERBERT C. MAIER.

Carcinoma of the Lung. ADRIAN LAMBERT

BELLEVUE HOSPITAL—THIRD (NEW YORK UNIVERSITY) SURGICAL DIVISION

8:00-10:00. *Neurosurgery* Operative Clinic. Thoracolumbar Sympathectomy for Hypertension. H. M. WICKREME, JOHN H. MULLHOLLAND and STAFF (Surg. G. R. K. 5—Capacity 5)8:00-10:00. *General Surgery* Operative Clinics (Operating Rm. K. 5 & K-6, Psychiatric Surgical Operating Room). JOHN H. MULLHOLLAND and STAFF. Thyroidectomy. JOHN A. LAWLER (O. R. A.)

Anterior Resection of the Rectum for Carcinoma. SAMUEL STANFORD (O. R. B.)

Section of Splincter of Oddi for Pancreatitis. JOHN MULLHOLLAND, HENRY DOUGLASS (O. R. C.)

Lumbar Sympathectomy for Peripheral Vascular Disease. WALLACE B. MURPHY (Operating Room D)

Murray-Brackett Osteotomy for Unilateral Fracture of Neck of Femur. IRVING S. SIEG (Bone Rm. K-6—Capacity 5)

10:00-12:00. *General Surgery* Nonoperative Clinics (I & K Bldg. Stewart Amph.)

Results of Section of Splincter of Oddi for Pancreatitis. HENRY DOUGLASS

Role of Sulfadiazine in Thyrotoxic Patients. JOHN A. LAWLER

Results and Follow-up in Carcinoma of the Rectum Treated with Anterior Resection. SAMUEL STANFORD

Pulmonary Complications in Surgery. WALTER CRANDALL

Fluid Compartments in Depleted Surgical Patients and Changes During Repletion. CO. TUN.

General Principles of Reconstructive Plastic Surgery of the Face. JOHN M. CONVERSE

Program of Postgraduate Training in Surgery at New York University College of Medicine. JOHN H. MULLHOLLAND

8:30-10:00. *Gynecology* Operative Clinic. WILLIAM E. STURMFOORD and STAFF (K-6 O. R.—Capacity 5)

Total Hysterectomy for Fibroid. CLAUDE E. HYATON.

Unusual Cases of Dysmenorrhea in Young Women—A Report of 3 Cases (paper)

Fascial Transplant for Relief of Strain Incontinence in Patients with Previous Operations. WILLIAM E. STURMFOORD

Pulmonary Complications in Surgery. WALTER CRANDALL

Fluid Compartments in Depleted Surgical Patients and Changes During Repletion. CO. TUN.

General Principles of Reconstructive Plastic Surgery of the Face. JOHN M. CONVERSE

Program of Postgraduate Training in Surgery at New York University College of Medicine. JOHN M. MULLHOLLAND

10:00-12:00. *Otolaryngology* Operative Clinic (K-6 O. R.) Laryngeal Surgery. JOHN F. DALY and STAFF10:00-12:00. *Anesthesia*. Demonstrations (K-6 O. R.). The Aesthetic Nerve Block Clinic. Anesthesia and Shock. E. A. ROYCE and STAFF10:00-12:00. *Rehabilitation and Physical Medicine* for Paraplegic. Demonstration of Program for the Rehabilitation of Paraplegic Patients. GEORGE DEWEY. (Wards F. O-3, F & G Bldg.—Capacity 25)10:00-12:00. *Case Demonstrations*. In the Study Room. J. GALVET, EDGAR H. BATES, JEROME W. MARCOT, WILLIAM MACKLER. (I & K Bldg. Stewart Amph.—Capacity 50)

BETH ISRAEL HOSPITAL

9:00-12:00. *Gynecology* Operative and Nonoperative Clinics. HENRY TALK and STAFF (Main O. R. 1st Fl.—Capacity 6 and 1st Lecture Rm.—Capacity 30)10:00-12:00. *Anesthesia*. Nonoperative Clinic. Clinical Demonstrations—Film on Hemorrhage and Shock. S. G. HENRIK and STAFF (3rd Fl. Lecture Rm.—Capacity 30)

FLOWER AND FIFTH AVENUE HOSPITALS

9:00-12:00. *Neurosurgery*. Operative Clinic. Lumbar Sympathectomy—Technique of Block. S. THOMAS GLASSER, DONALD E. BRACE. (Main O. R., 1st Fl.—Capacity 1)10:00-12:00. *General Surgery* Nonoperative Clinic: Head Infections. JAMES M. WENFIELD, JOHN HENRY (Amphitheatre—Capacity 300)

Nonoperative Clinic: Diseases of Vascular System. FREDERICK W. BANCROFT (Same Rm.)

10:00-12:00. *General Surgery* Nonoperative Clinic: Exhibit of Postgraduate School—Regional Anesthesia. JOSEPH H. FORTA. (Same Rm.)3:00-5:00. *General Surgery* Nonoperative Clinic: Functional Concept of the Internal Ring—Surgical Application in the Repair of Inguinal Hernia—Operating Room or Cadaver. J. CLIFFORD HAYTER. (7th Fl. College Anatomy Lab.—Capacity 50)

HARLEM HOSPITAL

9:00-12:00. *Traumatic Surgery* Nonoperative Clinic: Trauma Symposium. Ward Rounds. L. T. WICKER (Wards 2A, 2B, 3rd Bldg. and Conference Rm., 5th Fl. Women's Pavilion)

Head and Neck Injuries. D. H. SMITH, J. GREENE, S. BERENSON (Same Rm.)

Fractures of the Extremities with Late Results. A. C. LOGAN, W. A. FREEMAN, A. PETERLIN, C. DE LORENZO. (Same Rm.)

10:00-12:00. *Obstetrics* Nonoperative Clinic: Obstetrical Symposium. Emergency, Toxicity of Anesthetics. A. C. POKORSKY, J. N. PLESCHKE. (Conference F. 500)

Women's Pavilion—Capacity

HOSPITAL FOR JOINT DISEASES

- 9:00-12:00. *Orthopedic Surgery* Operative Clinic. HARRY SPÖRSCHEIM and STAFF
Transcervical Osteotomy for Slipped Femoral Epiphysis. A. KREIER. (Surg. Amph.—Capacity 50)
Femoral Shortening for Inequality of Leg Length. B. J. MINZ. (Same Rm.)
Nonoperative Clinic: Transcervical Osteotomy. A. KREIER.
Equalization of Leg Length. B. J. MINZ.
Tendon Transplantation for Radial Nerve Paralysis. H. ALTMAN. (Lecture Rm.—Capacity 60)
2:00-3:00. *Orthopedic Surgery* Nonoperative Clinic Demonstration X Rays of Primary Bone Tumors. MAURICE POMERANCE. (Lecture Rm.—Capacity 50)
3:00-4:00. *Ophthalmology* Operative Clinic: Operations on the Eye. JAMES W. SMITH. (Small O.R.—Capacity 5)
3:00-4:00. *General Surgery* Operative Clinic Surgery of the Hand. LEO MAYER. (Surg. Amph.—Capacity 50)
3:00-4:00. *Orthopedic Surgery* Nonoperative Clinic Surgical Anatomy Mechanism of Motion of Thumb. EMANUEL KAPLAN. (Lecture Rm.—Capacity 50)

HOSPITAL FOR SPECIAL SURGERY

- 8:30-12:00. *General Surgery* Operative Clinic. Operations by General Surgical Department. F. BECKMAN and STAFF. (Main O.R.—Capacity 32)
9:00-12:00. *Orthopedic Surgery* Adult Orthopedic Problems. PHILIP D. WILSON, R. STEINBERG and STAFF. (Lecture Rm.—Capacity 100)
2:00-5:00. *Orthopedic Surgery* Nonoperative Clinic Hip Problems.
Treatment of Fractures of Femoral Neck in the Aged. FERDINAND VON SAAL. (Same Rm.)
Anterior Wedge Osteotomy for Slipped Femoral Epiphyses. LEWIS CLARK WAGNER. (Same Rm.)
Trochanteric Arthroplasty. PHILIP D. WILSON. (Same Rm.)
Transplantation of External Oblique for Paralysis of Hip Abductors. LOWELL THOMAS, T. CAMPBELL THOMPSON, L. RAMSAY STRAUSS. (Same Rm.)
Treatment of Congenital Dislocation of the Hip with Anterior. FRANCIS CARR. (Same Rm.)
Idiopathic Aseptic Necrosis of the Hip in Adults. WILLIAM COOPER. (Same Rm.)

LENOX HILL HOSPITAL

- 9:00-12:00. *General Surgery* Nonoperative Clinic Rehabilitation and Physical Medicine. GEORGE G. DEWEY. (Elmhurst Auditorium—Capacity 450)
2:00-5:00. *General Surgery* Nonoperative Clinics
The Anti Coagulants and Their Use in Surgical Practice. CARL REICH. (Elmhurst Auditorium—Capacity 450)
RH Factor and Blood Bank Demonstration. JACOB GRIGER. (Same Rm.)

LYING-IN HOSPITAL

(See New York Hospital)

MANHATTAN EYE, EAR AND THROAT HOSPITAL

- 9:00-12:00. *Ophthalmology* Operative Clinic: Cataract Extraction, Corneal Transplant, Dacryocystorhinostomy G. BOVACOLLO. (Eye O.R., 6th Fl.—Capacity 5)
10:00-12:00. *Ophthalmology* Nonoperative Clinic: Laboratory Demonstration Bacteriology of the Eye. F. C. KELL, JR. (Path. Lab. 6th Fl.—Capacity 5)

- 10:00-12:00. *Otolaryngology* Nonoperative Clinic Demonstration Results in Cases of Arytenoidectomy J. D. KELLY. (Kelly Clinic, 2nd Fl.—Capacity 24)
10:00-12:00. *Ophthalmology and Otolaryngology* Nonoperative Clinic Plastic Surgery Clinic Conference on End-Results, Lantern Slides and Motion Pictures. J. M. CONVERSE, BYRON SMITH. (Conference Rm. 2nd Fl.—Capacity 70)
1:00-4:00. *Ophthalmology and Otolaryngology* Operative Clinic Plastic Surgery. BYRON SMITH, J. M. CONVERSE. (O.R. 6th Fl.—Capacity 5)
2:00-4:00. *Ophthalmology* Operative Clinic Corneal Graft R. T. PATON. (Same Rm.)
2:00-4:00. *Ophthalmology* Nonoperative Clinic Demonstration Vitreous Substitution Technique and End Results. MILO FETZ. (Eye Bank Lab. 10th Fl.—Capacity 12)
2:00-4:00. *Ophthalmology and Otolaryngology* Nonoperative Clinic Radiology Clinic: Radiation Therapy in Ophthalmology Results of Radiation in Laryngeal Tumors. MAURICE LENT, J. R. FREED, C. OKRAINEZ. (Radiotherapy Dept., 3rd Fl.—Capacity 12)
2:00-4:00. *Otolaryngology* Nonoperative Clinic Demonstration Radiation of Hypertrophied Lymphoid Tissue of Nasopharynx. H. D. TATNER. (Kelly Clinic, 2nd Fl.—Capacity 24)
2:00-5:00. *Otolaryngology* Operative Clinic Arytenoidectomy Operation. J. D. KELLY. (O.R. 6th Fl.)
3:00-5:00. *Ophthalmology* Nonoperative Clinic Demonstration Postoperative Corneal Graft Cases. R. T. PATON. (Conference Rm. 2nd Fl.—Capacity 70)

MEMORIAL HOSPITAL

- 9:00-12:00. *Tumor Surgery* Nonoperative Clinic Discussion Five Year Survivals in Lymphomas and Leukemias. LLOYD F. CRAVER. (Auditorium—Capacity 350)
The Use of Newer Nitrogen Mustard Compounds in the Treatment of Lymphomas and Leukemias. JOSEPH BURCHERL. (Same Rm.)
Nitrogen Mustard As a Palliative Agent in Cancer. DAVID KARSHOFKY. (Same Rm.)
The Role of Radioactive Iodine in Thyroid Cancer. JACK THURVELL. (Same Rm.)
Reasons for Delay in the Diagnosis of Cancer. JOHN L. LEACH, GUY ROBBINS. (Same Rm.)
Preoperative and Postoperative Care for Cancer of the Lung. JOHN E. LEACH, HENRY DIAMOND. (Same Rm.)
Study of Diagnostic Methods and Treatment of Cancer of the Lung. JOHN S. LADUE. (Same Rm.)
The Internist's Role in Cancer. WILLIAM H. LEWIS, JR. (Same Rm.)
Treatment of Shock. HENRY TAYLOR. (Same Rm.)
2:00-5:00. *Tumor Surgery* Nonoperative Clinic: Follow up Results in Different Types of Breast Cancer. FRANK ADLER. (Same Rm.)
3:30-5:00. *Tumor Surgery* Follow up Results in Patients with Metastatic Carcinoma of the Breast with Endocrine Therapy. FRANK ADLER. (Same Rm.)

METROPOLITAN HOSPITAL

- 9:00-12:00. *General Surgery* Nonoperative Clinic: Preoperative and Postoperative Treatment. JAMES M. WIDFIELD and STAFF and LOUIS R. KATZMAN, JOHN HERKELIN, EDWARD J. MCCABE. (Conference Rm.—Capacity 60)
General Discussion.
Fluid Balance. JOHN HERKELIN. (Same Rm.)

Early Ambulation and Early Exercise. EDWARD J. McCABE. (Same Rm.)

200-400. *Obstetrics and Gynecology* Nonoperative Clinics Interesting Ovarian Tumors. W. B. SILVERBLATT (Same Rm.)

Ectopic Pregnancy with Especial Reference to Posterior Colotomy. JOHN E. TATCHEL. (Same Rm.)

100-400. *Orthopedic Surgery and Fractures*. Nonoperative Clinic; Demonstration of End Results of Injuries to Lower Extremities. MERRICK J. WILSON and STAFF (Conference Rm., Welfare Dispensary, 80th E. and East End Ave.—Capacity 30)

MONTEFIORE HOSPITAL

100-300. *Therapeutic Surgery* Operative and Nonoperative Clinic. ARTHUR H. AYERS, LEONOR KROES. (O.R.—Capacity 1)

MOUNT SINAI HOSPITAL

8 30-1200. *General Surgery* Operative Clinic. Subtotal Gastrectomy and Infraesophageal Vagotomy for Duodenal Ulcer with Stenosis. RALPH COLE (Surg. Amph.—Capacity 100)

Nonoperative Clinics: Presentations Physiologic Differences between Gastric and Duodenal Ulcers. FRANK HOLLANDER. (Same Rm.)

A Rational Approach to the Surgery of Juxta Esophageal Ulcer. LEONARD DUCKERMAN. (Same Rm.)

Problems in the Treatment of Gastrojejunocolic Fistula. FRANK KILGORESTEIN. (Same Rm.)

Follow-up Results in Subtotal Gastrectomy for Gastric and Duodenal Ulcer. STANFORD MACR. (Same Rm.)

Indications for Vagotomy: Peptic Ulcer. RALPH COLE (Same Rm.)

100-300. *Otorhinolaryngology* Operative and Nonoperative Clinic: Inflammatory and Neoplastic Diseases of the Focal Sinuses. RUDOLPH KRAMER, MORRIS BECKER, IRVING GOLDMAN, JOSEPH DRUSE, SAMUEL ROSEN and STAFF. (Same Rm.)

Carcinoma of the Larynx and Results, Treatment by Radiation Therapy. RUDOLPH KRAMER, MORRIS BECKER, IRVING GOLDMAN, JOSEPH DRUSE, SAMUEL ROSEN and STAFF. (Same Rm.)

NEW YORK EYE AND EAR INFIRMARY

100-200. *Otolaryngology and Ophthalmology* Fundamentals of X-ray Diagnosis in Ophthalmology and Otolaryngology. IRVING SCHWARTZ (X-ray Viewing Rm.—Capacity 0)

100-300. *Ophthalmology and Otorhinolaryngology* Discussion. Allergy in Eye, Ear, Nose and Throat. HOWARD WESTCOTT (Allergy Clinic—Capacity 30)

100-400. *Otorhinolaryngology* Demonstration Equipment Including the Biplanar Fluoroscope in the Bronchoscopic Clinic. MAXWELL D. RYAN. (Bronchoscopic Clinic—Capacity 30)

1 30-430. *Otorhinolaryngology* Demonstration Methods—Allergy. J. H. BARNARD. (Allergy Clinic—Capacity 30)

100-300. *Ophthalmology* Demonstration Postoperative Treatment. R. MEKE and W. JOHNSON and ASSOCIATES. (Clinic Rm.—Capacity 30)

Diagnostic Studies with Special Reference to Muscle Studies. T. BOYCE and ASSOCIATES. (Same Rm.)

Surgery with Special Reference to Lacrimal Apparatus. B. PAYNE and R. McCLAMAHAN and ASSOCIATES. (Eye O.R.—Capacity 1)

Routine Clinics of the New York Eye and Ear Infirmary will be held as usual during this period, all Fellows of the American College of Surgeons are cordially invited to attend.

NEW YORK HOSPITAL

900-1200. *Plastic and Reconstructive Surgery*. Operative and Nonoperative Clinics: One Stage Push Back Operation for Congenitally Short Palate. Miscellaneous Case Presentations. HERBERT CONWAY. (Rm. F630—Capacity 70)

Speech Therapy in Cases of Cleft Palate. E. FITZ. (Same Rm.)

End-Results Following Radical Breast Amputation With Split Skin Grafting. CHARLES NEWMAN. (Same Rm.)

Demonstration of Technique of Tattooing Skin Grafts and Port Wine Stains. HERBERT CONWAY, FRANK ELISON. (Same Rm.)

900-1200. *Ophthalmology* Operative Clinic: Intracapsular Cataract; Glaucoma, Strabismus. JOHN McALL and STAFF. (7th Fl. O.R. 1 Rm.—Capacity 30)

1200-500. *General Surgery* Operative and Nonoperative Clinic. FRANK GLENN and STAFF. Surgical Treatment of Acute Cholecystitis. FRANK GLENN. (College Auditorium, Rm. 8001—Capacity 350)

Pathology of Acute Cholecystitis. N. C. FOOTE. Complications of Acute Cholecystitis. S. R. MOORE.

Diverticulitis of Large Bowel, Follow-up Studies. GUNTER CHILDS.

Follow-up Studies of Polyps of the Large Intestine. S. W. MOORE.

Demonstration and Exhibit. Surgical Pathological Laboratory. N. C. FOOTE.

1200-500. *General Surgery* Demonstration. Surgical Anatomy. Anatomy Involved in Lumbar and Thoracolumbar Sympathectomy. EMMETT LAMPE. (Rm. A 38—Capacity 5)

1200-500. *Otorhinolaryngology* Nonoperative Clinic: One Presentations and Postoperative Results. Laryngofissure, Carcinoma of Antrum, Meningioma with Petrositis and Meningitis. Acute Frontal Sinusitis with Meningitis. ARTHUR PALMER and ASSOCIATES. (Rm. F630—Capacity 70).

NEW YORK HOSPITAL

LYING-IN HOSPITAL

900-1200. *Gynecology* Operative Clinic: Gynecological Operations. H. J. STANLEY. (Gyn. O. R., 2 Rm.—Capacity 30)

1200-500. *Obstetrics and Gynecology* Nonoperative Clinic: Late Results in Patients with Recurrent Abortion. CARL T. J. VERT. (Lecture Rm.—Capacity 100).

Echampsia. H. J. STANLEY. (Same Rm.)

Treatment of Endocervicitis. RALPH W. G. CUL. (Same Rm.)

X-ray Pelvimetry. CHARLES M. McLAKE. (Same Rm.)

Miscellaneous Abortion. FRANK SMITH. (Same Rm.)

NEW YORK ORTHOPEDIC DISPENSARY AND HOSPITAL

900-1200. *Orthopedic Surgery* Rounds. End-Result Conference. ALAN DE FOREST SMITH. (7th Fl. Assembly Rm.—Capacity 30)

Osteoarthritis of the Hip. FRANK STURGEONFIELD. (Same Rm.)

Slipping of the Upper Femoral Epiphysis. M. H. HOWARTH. (Same Rm.)

30-400. *Orthopedic Surgery*. General Orthopedic Clinic. LEONIDAS A. LASTROUKIS and STAFF. (Same Rm.)

Scold's Clinic. WILLIAM H. VON LACKEN. (Same Rm.)

PRELIMINARY PROGRAM—1947 CLINICAL CONGRESS

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NEW YORK POST-GRADUATE MEDICAL SCHOOL AND HOSPITAL

- 8:30-9:30. *Neurosurgery* Operative Clinic. Diagnostic Procedures. J. A. MACLEAM (O.R. 4—Capacity 10)
 8:30-11:30. *Urology* Operative Clinic. CLARENCE BARNES (O.R. 5—Capacity 10)
 8:30-12:00. *Tumor Surgery* Operative Clinic. H. W. MEYER (O.R. 3—Capacity 10)
 8:30-12:00. *General Surgery* Operative Clinic. E. J. DICKSON (O.R. 1—Capacity 10)
 Operative Clinic. R. FRANKLIN CARTER. (Surg. Amph. 1—Capacity 50)
 10:30-12:30. *General Surgery* Nonoperative Clinic. Case Presentations of Operative Procedures In Gastrointestinal and Gastro-intestinal Ulcer with a Discussion of the Indications and Contra-indications for 1. S. ARTHUR LOCALLO. PHILIP A. ZOLLER. (Erdmann Auditorium—Capacity 125)
 10:30-12:30. *Traumatic Surgery* Nonoperative Clinic. Fractures. H. H. RITTER. (Amph. D—Capacity 30)
 11:30-12:00. *Oral Surgery* Operative Clinic. F. S. DUNN (O.R. 5—Capacity 10)
 12:00-1:30. *Orthopedic Surgery* Nonoperative Clinic. Demonstration of Orthopedic Conditions—Pro and Post Operative. GEORGE ANTONIO. (Amph. C)
 1:00-1:30. *Neurosurgery* Operative Clinic. J. A. MACLEAM (O.R. 5—Capacity 10)
 1:00-2:00. *Traumatic Surgery* Operative Clinic. H. H. RITTER. (Surg. Amph.—Capacity 50)

PRESBYTERIAN HOSPITAL

- 8:00-12:00. *General Surgery* Operative Clinic. Surgery of the Pancreas. JOHN S. LOCKWOOD, WILLIAM B. FARLEY. (19th Fl., Main O.R. C—Capacity each 10)
 Surgery of the Spleen. LOUIS M. ROUSSELOT, ROBERT H. ELLIOTT. (Same Rm.)
 Resection of Mandible For Carcinoma. MAURICE J. HICKY. (Same Rm.)
 Lobectomy for Chronic Bronchiectasis. RICHMOND L. MOORE. (Same Rm.)
 2:00-4:00. *General Surgery* Nonoperative Clinic. Tissue Culture as an Adjunct to Surgery. MARGARET ALLEN. (McCosh Amph. 18th Fl.—Capacity 145)
 Phlebograms of the Lower Extremity. DAVID C. BULL. (Same Rm.)
 Oxidized Cellulose in Surgery. VIRGINIA K. FRAMPTON. (Same Rm.)
 Electrophoretic Studies of Plasma in Extensive Burns. JOHN SCUDDER. (Same Rm.)
 Indications for Portacaval Shunt. ARTHUR H. BLAZER-MORE. (Same Rm.)

PRESBYTERIAN HOSPITAL

- 9:00-12:00. *General Surgery* Operative Clinic. General Clinic and Ward Rounds. Members of Staff. (O.R. 1 & 2, 6th Fl.—Capacity each 6)
 12:00-4:00. *General Surgery* Nonoperative Clinic. Congenital Diaphragmatic Hernia. Follow-up. EDWARD J. DOVOVAK. (Amph. 4th Fl.—Capacity 75)
 An Analysis of the Neoplasms in Childhood Encountered at Babies Hospital in the Past Ten Years. DOROTHY H. ANDERSEN.
 Meconium Ileus. Presentation of Cases. Motion Pictures Illustrating Pathology and Operative Procedure. ROBERT B. BLATT
 Acute Appendicitis in Children. A Comparison of the Last Two Five-Year Periods with and without Chemotherapy. EARL C. TAYLOR.

PRESBYTERIAN HOSPITAL SLOANE HOSPITAL FOR WOMEN

- 9:00-10:30. *Obstetrics and Gynecology* Operative Clinic. Total Hysterectomy. E. COLER (O.R. 17th Fl.—Capacity 30)
 10:30-12:30. *Obstetrics and Gynecology* Operative Clinic. Myomectomy. JAMES CORBACEN (Same Rm.)
 12:00-1:00. *Obstetrics and Gynecology* Nonoperative Clinic. Rh Factor in Obstetrics. J. GREER. (Lecture Rm. 17th Fl.—Capacity 40)
 1:00-2:00. *Obstetrics and Gynecology* Nonoperative Clinic. Review of Cardiac Deaths During Pregnancy 1925-47. A. J. TILMAN (Same Rm.)

PRESBYTERIAN NEW YORK ORTHOPEDIC HOSPITALS

- 9:00-12:00. *Fracture Service* Fracture Service Clinic. Fracture and Traumatic Surgery. Operative Clinic. FRACTURE SERVICE STAFF (Main O.R., 19th Fl.—Capacity 8)
 1:30-4:00. *Fractures and Traumatic Surgery* Nonoperative Clinic. Complicated Elbow Fractures with Follow-up Results. FREDERICK M. SMITH. (Rm. 417 16th Fl. Phys. & Surg. Bldg.—Capacity 100)
 Replacement of Articular Elements. STEPHEN S. HUNTER. (Same Rm.)

ROOSEVELT HOSPITAL

- 12:00-5:00. *Genitourinary* Operative Clinic. Suprapubic Prostatectomy. SIMON A. BEISLER and STAFF (O.R. 1-4—Capacity 50)
 Nonoperative Clinic. The Presentation of Patients, Illustrating the Results of Urological Procedures. Total Cystectomy With Skin and Sigmoidal Implantation. SIMON A. BEISLER and STAFF (Conf. Rm. 1—Capacity 50)
 The Replantation of Skin Ureterostomies Into the Bowel. SIMON A. BEISLER and STAFF (Same Rm.)

ST LUKE'S HOSPITAL

- 8:30-11:00. *General Surgery* Operative Clinic. General Surgery. WILLIAM MACFEE and STAFF (Lyle O.R.—Capacity 30)
 11:00-12:00. *General Surgery* Clinical Demonstrations. Benign Intrathoracic Tumors. ALEXANDER ADA. (Staff Conference Rm.—Capacity 60)
 Cervical Disks. HERBERT FARROW. (Same Rm.)
 Carcinoma of the Lower Sigmoid and Upper Rectum. WILLIAM MACFEE. (Same Rm.)
 Trends in Cure—Technique Anesthesia. EDWARD BURFORD and STAFF (Same Rm.)
 Carcinoma of Colon—Ten Year Study. EDWARD DORFMAN. (Same Rm.)
 Management of Hemorrhage for Gastric and Duodenal Ulcers. ROBERT FRANKER. (Same Rm.)
 1:00-2:00. *Ophthalmology* Operative Clinic. GUINNESS FREY and STAFF (Lyle O.R.—Capacity 6)
 2:00-3:00. *Ophthalmology* Clinical Demonstrations. Glaucoma. Results of Operation. GUINNESS FREY (Staff Conference Rm.—Capacity 60)
 Extraocular Muscle Surgery. Follow-up Results. HENRY SMITH. (Same Rm.)

ST VINCENT'S HOSPITAL

- 9:00-12:00. *Gynecology and Obstetrics* Operative Clinic. Vaginal Plastic. Abdominal Hysterectomy. Vaginal Hysterectomy. Cesarean Section. JOHN McGRATH. JAMES P. HEDDERLEY. THOMAS E. LAVELL. JOSEPH J. CORRY. THOMAS IYIDKO. ROBERT LOWRIE. JOHN

- KILGUS, WALTER P. GAGE. (O.R. C & D—Capacity each)
- 1000-1200. *General Surgery* Nonoperative Clinic: Round Table Conference: Use of Transverse Incisions. JOHN A. LAWLER. (Nurse's Lecture Rm.—Capacity 60)
- Malignant Tumors Small Intestine. CLARENCE F. HOWLEY. (Same Rm.)
- 1000-1200. *Radiology* Nonoperative Clinic: Roentgen Diagnosis of Lesions of Small Intestines. Differential Diagnosis of Mechanical and Adynamic Ileus. WALLACE MATHER and ASSOCIATES. (Viewing Rm.—Capacity 25).
- 1200-1300. *Gynecology and Obstetrics* Nonoperative Clinic: Round Table Conference.
- Study of Vaginal Spread for Carcinoma of Cervix. Differential Diagnosis in Cases of Acute Pelvic Pathology. Indications for Cesarean Section. Choice of Operation in Uterine Prolapse. JOHN McGRATH and ASSOCIATES. (Nurse's Auditorium—Capacity 50)
- 300-400. *Pathology* Nonoperative Clinic: Study of Abdominal and Chest Fluids: Evidence of Malignancy. Display of First Pathological Material. Display and Demonstration of System Diseases by Kodachrome Slides. A. ROTTINO and ASSOCIATES. (Same Rm.)
- 400-500. *General Surgery* Nonoperative Clinic: Thrombosis and Embolism. LOUIS F. SANMAR. (Same Rm.)

SLOANE HOSPITAL FOR WOMEN

(See Presbyterian Hospital)

U. S. MARINE HOSPITAL (STATEN ISLAND)

- 900-1000. *Orthopedic Surgery* Nonoperative Clinic: Orthopedic Conference. A. A. MITCHELL and STAFF. (Doctor's Staff Rm.—Capacity 75)
- 1000-1100. *General Surgery* Nonoperative Clinics: H. L. SKIDDER, CHARLES FERGUSON and STAFF.
- Regional Ileitis—Discussion and Case Presentation. (Doctor's Staff Rm.—Capacity 75)
- Benign Lesion of Colon—Discussion and Case Presentation. (Same Rm.)
- Malignant Lesion of Colon—Discussion and Case Presentation. (Same Rm.)
- 1230-1300. Luncheon at the Hospital.
- 1200-1300. *General Surgery* Operative Clinic: Stomach Resection Under Balanced Anesthesia. W. F. NICKEL and RESIDENT STAFF. (General O.R.—Capacity)
- 100-1200. *Orthopedic Surgery* Operative Clinic: Herniated Intervertebral Disc with Exploration and Fusion. H. L. SKIDDER, A. A. MITCHELL and STAFF. (General O.R.—Capacity)

VETERANS ADMINISTRATION HOSPITAL

- 900-1200. *General Surgery* Operative Clinic. EDWIN STUP. DAVID K. POKES. (Bldg. D. Rm., 5th Fl.—Capacity 20)

- 900-1200. *Neurosurgery* Operative Clinic: Frontal Lobotomy. JOHN E. SCARRY. EDWIN KATZNER. (Bldg. D. 5th Fl. Rm.—Capacity 1)
- 900-1200. *Genitourinary Surgery* Operative Clinic: LOUIS SPYVACE, EDWIN J. DREW. (Bldg. D, 5th Fl., Rm.—Capacity)
- 900-1200. *Plastic Surgery* Operative Clinic. HENRY CONWAY, CORNELIUS J. KRAMER. (Bldg. B, 5th Fl., 1 Rm.—Capacity 6)
- 900-1200. *Orthopedic Surgery* Nonoperative Clinic: Conference: Presentation of End-Results—Bone Tumors, Bone and Joint Tuberculosis. Presentation of Cases. PHILIP D. WILSON, SYDNEY N. EICHENBOM, ROBERT PATTERSON, FRANK E. STODOLSKY, and RESIDENT STAFF. (Bldg. C, 4th Fl.—Capacity 30)
- 930-1000. *General Surgery* Nonoperative Clinic: Medical Rehabilitation Clinic. HARRY KEMLER, KEN HARPODER, IRWIN D. STEIN, BERNARD STOLL, JAMES BYER. (Bldgs. B, C, & F Ground Fl.—Capacity 10)
- 100-1200. *General Surgery* Nonoperative Clinic: Result of Vagus Resection. P. K. SAUER, JOHN ECKEL, CHRISTIAN HOLMAN, FRANK J. MCGOWAN, CHARLES PRITCHARD, and RESIDENT STAFF
- 1100-1230. *Neurosurgery* Nonoperative Clinic: Frontal Lobotomy. JOHN E. SCARRY. THOMAS RYMER, HILAND L. FLOWERS.
- 130-1330. *Neurosurgery* Nonoperative Clinic: Conference: Complications in Frontal Cranioplasty Involving Frontal Sinus. Surgery of the Sympathetic Nervous System for Painful Conditions. Leptomenigeal and Porencephalic Cyst with Increased Intracranial Pressure. Surgical Treatment of Pilonidal Tract by Cervical Midline Inc. Lucic Pachymeningitis with Increased Intracranial Pressure. JOHN E. SCARRY, FRANK CHAMBER, E. G. KATZNER, J. LAWRENCE POOL. (Bldg. A, 3rd Fl.—Capacity 200)
- 100-1200. *Otolaryngology* Operative Clinic. PETER D. LATTELLA. (Bldg. B 5th Fl.—Capacity 1)
- 330-500. *Urology* Nonoperative Clinic: Conference: ARTHUR DRAH, LOUIS SPYVACE, PERLIN SYDNER, EDWIN J. DREW, WILLET WHITMORE, JOHN K. LATTELL, and RESIDENT STAFF. (Bldg. A, 3rd Fl.—Capacity 200)

EXHIBITS

(Bldg. A, 3rd Fl.)

Anesthesia Section	Results of Vagus Resection
Bronchogenic Carcinoma	Pathology Section
Review of 600 Cases	Medical Illustrations
Intracranial Neoplasms	Laboratory
Residency Training Program	Plastic Surgery
Organization of Surgical Division	Prosthetic Appliances

CLINICS IN BROOKLYN—LONG ISLAND HOSPITALS

Thursday

BROOKLYN EYE AND EAR HOSPITAL

- 900-1200. *Ophthalmology Otolaryngology and Faciomaxillary Surgery* Late Results in Faciomaxillary Surgery. Late Results in Laryngotomies. Late Results in Glaucoma Surgery. Angiostomometry Exhibit. Motion Picture Demonstration on the Development of the Human Eye as Shown by Animation. G. R. O'BRIEN, JOHN P. BAKER, CHARLES LAMBERTA, JOHN EVANS, G. H. PATT. (Ph.D.). (Solarium—Capacity 40).

- 100-1200. *Plastic Surgery* Operative Clinic: AARL GERALD R. O'BRIEN and STAFF. (5th Fl. O.R. 1-4 Capacity 20)

CUMBERLAND HOSPITAL

- 900-1200. *Fractures and Traumatic Surgery* Operative and/or Nonoperative Clinics: Pinning for Femur Neck Fracture. LEO FARRER and STAFF. (Auditorium—Capacity 300).

PRELIMINARY PROGRAM—1947 CLINICAL CONGRESS

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KINGS COUNTY HOSPITAL

Late Results in Fracture of Femur Neck. (Same Rm.)
 Traumatic Abdomen JOSEPH I. AXTON (Same Rm.)
 Ward Rounds with X-ray Studies of Various Types of Fractures. LEO FALKER and STAFF (Wards 46, 51—Capacity 15)
 12:30-1:30. Luncheon at the Hospital.
 1:30-3:00. Fractures and Traumatic Surgery Nonoperative Clinics
 Discussion. NOUNKON, Late Results and General—Capacity 300
 Ward Rounds with Demonstration of Apparatus in Use. JOSEPH NEVINS and STAFF (Auditorium)
 JOSEPH NEVINS and STAFF (Wards 46, 51—Capacity 15)
 Gadgets and Their Use in Fracture Treatment JOSEPH NEVINS and STAFF (Same Rm.)
 Head Injuries. Late Results. FRANK TURNEY (Auditorium—Capacity 300)

8:30-12:00. *General Surgery* Operative Clinics
 Dorsal Cordotomy for Painful Phantom Foot. E. JEFFERSON BROWDER. (B. Bldg. O.R. 1-10—Capacity 15)
 Sympathectomy for Arterial Hypertension. EVERETT CORRADINI (Same Rm.)
 Capsular Fiber Section for Parkinsonism. E. JEFFERSON BROWDER. (Same Rm.)
 Dorsal Rhizotomy for Spasticity of Cerebral Palsy FRANK TURNEY (Same Rm.)
 9:00-12:00. *General Surgery* Operative Clinic. JOSEPH TENOPPE and STAFF (B. Bldg. O.R. 1-10—Capacity 15)
 9:00-12:00. *Thoracic Surgery* Operative Clinic. Segmental Resection of the Lung. LEW A. HOCHBERG. (B. Bldg. O.R.F. Capacity 15)
 12:00-3:00. *General Surgery* Nonoperative Clinic Follow-up Fractures JOSEPH TENOPPE. (Main Bldg. Rm. B3—Capacity 50)
 3:00-5:00. *Vascular Surgery* Nonoperative Clinics
 The Cerebral Hemangioblastomas EVERETT CORRADINI (Main Bldg. Lecture Rm. 1st Fl.—Capacity 40)
 Cysticercus Disease of the Brain. LESTER KIERD (Same Rm.)
 Surgery for Parkinson's Disease. E. JEFFERSON BROWDER. (Same Rm.)
 Management of Fractures of the Spine with Spinal Cord Damage. FRANK TURNEY (Same Rm.)
 Subdural Hematoma. RICHARD GRIMES. (Same Rm.)
 3:00-5:00. *Thoracic Surgery* Nonoperative Clinics
 Lung Abscess as Seen at the Kings County Hospital ALFRED D. BICUTMAN. (F. Bldg. Chapel—Capacity 100)
 Pneumomycosis in Cases of Pulmonary Tuberculosis. EDWIN H. GRIFFIN. (Same Rm.)
 Some Experiences in the Management of Chronic Empyema. ELIOT K. JOHNSON. (Same Rm.)
 Paradoxical Respiration—Its Causes, Consequences and Treatment. LEW A. HOCHBERG. (Same Rm.)

HOUSE OF ST GILES THE CRIPPLE

11:00-12:00. *Orthopaedic Surgery* Operative Clinic. Abduction Traction Splint for Congenital Dislocation of Hip. C. C. VITALS (Roof Clinic—Capacity 60)
 Shoulder Fusion, for Polio Field Shoulders, five-year Follow-up. Demonstration of Cases. C. C. VITALS. (Same Rm.)
 Follow-up on Shelf Operation, for Congenital Dislocation of Hip. Presentation of Cases. J. GLANZENTH. (Same Rm.)
 Recurrent Clubfoot, Demonstration of Cases Following Resection of Head of Talus Plus Transplantation of Anterior Tibial Tendon. A. OAKES. (Same Rm.)
 Demonstration of Cases Following Tereb Major Transplantation for Obstetrical Palsy C. C. VITALS. (Same Rm.)

JEWISH HOSPITAL

8:00-10:00. *General Surgery* Operative Clinic. PAUL W. ASCHEVER and STAFF (Amph. 1—Capacity 25)
 Operative Clinic. LEO S. SCHWARTZ and STAFF (Amph. 2—Capacity 25)
 10:00-12:00. *Gynecology and Obstetrics* Nonoperative Clinic
 Puerperal Hematomas of Vulva. PAUL PEDOWITZ (Auditorium—Capacity 300)
 Subcutaneous Heparin in Thromboembolic Disease in Gynecology and Obstetrics HARRY J. GREENGLASS. (Same Rm.)
 A Study of Pelvic Drive in Obstetrics EDWIN AL. GOLD. (Same Rm.)
 Hydranidias and Infertility CHARLES BIENBERG. (Same Rm.)
 Failed Forcyp. LEONORE DACHMAN WILLIAM PUM. (Same Rm.)
 Studies with Gonadotropin. SAMUEL A. WOLFE, IRWIN NEVINS. (Same Rm.)
 12:00-1:00. *Gynecology and Obstetrics* Nonoperative Clinic
 Diagnosis and Treatment of Solitary Cyst of the Kidney by Aspiration and Infection. ABRAHAM D. SEGAL. (Conference Rm.—Capacity 40)
 Treatment of Hydrocoele by Sclerosing Agents. LOUIS H. BARKETZ. (Same Rm.)
 Peritonitis and Oviditis Puer Complicating Urologic Procedures ZACHARY R. COTTLER, SAMUEL PARMAR. (Same Rm.)
 Destructive Urography in Children. PERRY KATZEM. (Same Rm.)
 Serum Acid Phosphatase in the Diagnosis and Management of Carcinoma of the Prostate. LEONORE KIM MCEL, PAUL W. ASCHEVER. (Same Rm.)

KINGS COUNTY HOSPITAL LONG ISLAND COLLEGE DIVISION

8:30-12:00. *General Surgery* Operative Clinics
 Gastric Resection. EDWARD P. DUNN. (B. Bldg. O.R. 1-10—Capacity 30)
 Large Bowel Resection CHARLES B. JONES. (Same Rm.)
 Gall Bladder and Common Duct Exploration. PHILIP E. LEAR. (Same Rm.)
 Ligation Patent Ductus Arteriosus. JOHN L. MADDEN. (Same Rm.)
 12:45-3:00. *General Surgery* Nonoperative Clinics
 Diagnosis and Treatment of Lymphogranuloma Venereum, Anus Rectum, and Colon. CHARLES B. JONES. (Same Rm.)
 Paraduodenal Hernia, Report of Four Cases. PHILIP E. LEAR. (Same Rm.)
 Cosmetic Incision for Excision of Benign Breast Tumors and for Suppurative Diseases of the Female Breast. GASTALDO T. DEYANNA. (Same Rm.)
 Tetanus—A Surgical Problem. Experience with Five Hundred Cases in China. PHILLIPS F. GREENE. (Same Rm.)
 Gastrojejunocolic Fistula. Six Case Reports JOHN L. MADDEN. (Same Rm.)
 Follow-up Results in Hip Nailing Operations in Femoral Neck. ARNOLD F. SAMUELS. (Same Rm.)

- KELGUS, WALTER P. GAGE. (O.R. C & D—Capacity each 50).
- 100-100. *General Surgery* Nonoperative Clinic Round Table Conference Use of Transverse Incisions. JOHN A. LAWLER. (Nurse's Lecture Rm.—Capacity 60)
- Malignant Tumors Small Intestine. CLARENCE P. HOWLEY (Same Rm.)
- 1000-1200. *Radiology* Nonoperative Clinic Roentgen Diagnosis of Lesions of Small Intestines. Differential Diagnosis of Mechanical and Adynamic Ileus. WALLACE MAYER and ASSOCIATES. (Viewing Rm.—Capacity 25)
- 1200-1300. *Gynecology and Obstetrics* Nonoperative Clinic Round Table Conference
- Study of Vaginal Spread for Carcinoma of Cervix Differential Diagnosis in Cases of Acute Pelvic Pathology Indications for Cesarean Section. Choice of Operation in Uterine Prolapse. JOHN McGRATH and ASSOCIATES. (Nurse's Auditorium—Capacity 50)
- 1300-1400. *Pathology* Nonoperative Clinic Study of Abdominal and Chest Fluids for Evidence of Malignancy Display of First Pathological Material. Display and Demonstration of System Diseases by Kodachrome Slides. A. ROTTINO and ASSOCIATES. (Same Rm.)
- 1400-1500. *General Surgery* Nonoperative Clinic Thrombosis and Embolism. LOUIS F. BARNER. (Same Rm.)

SLOANE HOSPITAL FOR WOMEN (See Presbyterian Hospital)

U. S. MARINE HOSPITAL (STATEN ISLAND)

- 9:00-1:00. *Orthopedic Surgery* Nonoperative Clinic: Orthopedic Conference. A. A. MICHELS and STAFF (Doctor's Staff Rm.—Capacity 75)
- 100-130. *General Surgery* Nonoperative Clinics H. L. SCHWARTZ, CHARLES FERGUSON and STAFF
- Regional Ileitis—Discussion and Case Presentation (Doctor's Staff Rm.—Capacity 75)
- Benign Lesion of Colon—Discussion and Case Presentation. (Same Rm.)
- Malignant Lesion of Colon—Discussion and Case Presentation. (Same Rm.)
- 130-100. Luncheon at the Hospital.
- 200-300. *General Surgery* Operative Clinic. Stomach Resection Under Balanced Anesthesia. W. F. NICHOL and RESIDENT STAFF (General O.R.—Capacity 100)
- 300-300. *Orthopedic Surgery* Operative Clinic Herniated Intervertebral Disc with Exploration and Fusion. H. L. SCHWARTZ, A. A. MICHELS and STAFF (General O.R.—Capacity 100)

VETERANS ADMINISTRATION HOSPITAL

- 9:00-12:00. *General Surgery* Operative Clinic. EDWIN SELZ DAVID K. PETER. (Bldg. D Room 2th Fl.—Capacity 20)

- 9:00-12:00. *Neurosurgery* Operative Clinic: Frontal Lobotomy. JOHN E. SCARFF, ERIC KREIDER. (Bldg. D 2th Fl. 1 Rm.—Capacity 10)
- 9:00-100. *Genitourinary Surgery* Operative Clinic: LOTS SPITVACK, EDWIN J. DREW. (Bldg. D 2th Fl. Rm.—Capacity 10)
- 9:00-12:00. *Plastic Surgery* Operative Clinic. HENRY CONWAY CORNELIUS J. KRAHSEL. (Bldg. B 5th Fl. Rm.—Capacity 10)
- 9:00-100. *Orthopedic Surgery* Nonoperative Clinic Conference: Presentation of End-Results—Bone Tumors, Bone and Joint Tuberculosis. Presentation of Cases. PHILIP D. WILSON, SYDNEY N. ECKHARDT, ROBERT PATTERSON, FRANK E. STEINBUEHL, and RESIDENT STAFF (Bldg. C, 4th Fl.—Capacity 10)
- 9:30-100. *General Surgery* Nonoperative Clinic: Medical Rehabilitation Clinic. HARRY KESLER, KURT HARPOUDER, IRWIN D. STEIN, BERND STOLL, JACOB BYER. (Bldgs. B, C, & F Ground Fl.—Capacity 20)
- 1200-130. *General Surgery* Nonoperative Clinic: Result of Vagus Resection. P. K. SALTER, JOHN ECKHARDT, CHARLTON HOLMAN, FRANK J. MCGOWAN, CHARLES PRUITT, and RESIDENT STAFF
- 100-12:30. *Neurosurgery* Nonoperative Clinic: Frontal Lobotomy. JOHN E. SCARFF, THOMAS RYAN, HILAND L. FLOWERS.
- 10-130. *Neurosurgery* Nonoperative Clinic: Conference: Complications in Frontal Cranioplasties Involving Frontal Sinus. Surgery of the Sympathetic Nervous System for Painful Conditions. Leptomenigeal and Porencephalic Cyst with Increased Intracranial Pressure. Surgical Treatment of Pilonidal Limb. Compression of the Anterior Pyramidal Tract by Cervical Midline Disc. Lentic Pachymeningitis with Increased Intracranial Pressure. JOHN E. SCARFF, FRANK CHAMBER, E. G. KREIDER, J. LAWRENCE POOL. (Bldg. A, 3rd Fl.—Capacity 200)
- 1000-1400. *Otolaryngology* Operative Clinic. PETER D. LATTELLA. (Bldg. B 5th Fl.—Capacity 10)
- 130-1200. *Urology* Nonoperative Clinic: Conference. ARTHUR DEAN, LOUIS SPITVACK, PETER SYDNEY, EDWIN J. DREW (WILLET WESTGATE, JOHN K. LATTELL, and RESIDENT STAFF (Bldg. A, 3rd Fl.—Capacity 200)

EXHIBITS (Bldg. A, 3rd Fl.)

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| Anesthesia Section | Results of Vagus Resection |
| Bronchogenic Carcinoma. | Pathology Section |
| Review of 600 Cases | Medical Illustrations |
| Intracranial Neoplasms | Laboratory |
| Residency Training Program | Plastic Surgery |
| Organization of Surgical Division | Prosthetic Appliances |

CLINICS IN BROOKLYN—LONG ISLAND HOSPITALS

Thursday

BROOKLYN EYE AND EAR HOSPITAL

- 9:00-12:00. *Ophthalmology Otolaryngology and Faciomaxillary Surgery* Late Results in Faciomaxillary Surgery Late Results in Laryngotomies. Late Results in Glaucoma Surgery Angiostomometry Exhibit. Motion Picture Demonstration on the Development of the Human Eye as Shown by Animation. G. R. O'BRIEN, JOHN P. BAKER, CHARLES LABROLA, JOHN EVANS, G. H. PATT (Ph.D.) (Solarium—Capacity 40).

- 100-1200. *Plastic Surgery* Operative Clinic: Aest. GERALD R. O'BRIEN and STAFF (7th Fl. O.R. 1-4 Capacity 20)

CUMBERLAND HOSPITAL

- 9:00-100. *Fractures and Traumatic Surgery* Operative and/or Nonoperative Clinics: Plating for Femur Neck Fracture. LEO FARBER and STAFF (Auditorium—Capacity 300)

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Late Results in Fracture of Femur Neck. (Same Rm.)
Traumatic Abdomen. JOSEPH I. ANTON. (Same Rm.)
Ward Rounds with X Ray Studies of Various Types of Fractures. LEO FARRER and STAFF. (Wards 46, 51—Capacity 15)
12:30-1:30. Luncheon at the Hospital.
1:30-2:00. *Fractures and Traumatic Surgery* Nonoperative Clinics. Noonman, Late Results and General Discussion. JOSEPH NEVINS and STAFF. (Auditorium—Capacity 300)
Ward Rounds with Demonstration of Apparatus in Use. JOSEPH NEVINS and STAFF. (Wards 46 51—Capacity 15)
Gadgets and Their Use in Fracture Treatment. JOSEPH NEVINS and STAFF. (Same Rm.)
Head Injuries. Late Results. FRANK TURNER. (Auditorium—Capacity 300)

KINGS COUNTY HOSPITAL

8:30-1:00. *New Surgery* Operative Clinics
Dorsal Cordotomy for Painful Phantom Foot. E. JEFFERSON BROWDER. (B Bldg. O.R. 1-10—Capacity 15)
Sympathectomy for Arterial Hypertension. EVERETT CORADINI. (Same Rm.)
Capsular Fiber Section for Parkinsonism. E. JEFFERSON BROWDER. (Same Rm.)
Dorsal Rhizotomy for Spasticity of Cerebral Palsy. FRANK TURNER. (Same Rm.)
9:00-1:00. *General Surgery* Operative Clinic. JOSEPH TENOPYR and STAFF. (B Bldg. O.R. 1-10—Capacity 15)
9:00-1:00. *Thoracic Surgery* Operative Clinic. Segmental Resection of the Lung. LEW A. HOCHEMRO. (B Bldg. O.R.F.—Capacity 15)
1:00-3:00. *General Surgery* Nonoperative Clinic. Follow up Fractures. JOSEPH TENOPYR. (Main Bldg. Rm. B3—Capacity 50)
1:00-3:00. *Neurosurgery* Nonoperative Clinics
The Cerebellar Hemangioblastomas. EVERETT CORADINI. (Main Bldg. Lecture Rm. 1st Fl.—Capacity 40)
Cysticercus Disease of the Brain. LESTER REED. (Same Rm.)
Surgery for Parkinson's Disease. E. JEFFERSON BROWDER. (Same Rm.)
Management of Fractures of the Spine with Spinal Cord Damage. FRANK TURNER. (Same Rm.)
Subdural Hematoma. RICHARD GRIDER. (Same Rm.)
1:00-3:00. *Thoracic Surgery* Nonoperative Clinics
Lung Abscess as Seen at the Kings County Hospital. ALFRED D. BICUMAS. (F Bldg. Chapel—Capacity 100)
Pneumolysis in Cases of Pulmonary Tuberculosis. EDWIN H. GRIFITH. (Same Rm.)
Some Experiences in the Management of Chronic Empyema. ELOISE E. JOHNSON. (Same Rm.)
Paradoxical Respiration—Its Causes, Consequences and Treatment. LEW A. HOCHEMRO. (Same Rm.)

HOUSE OF ST. GILES THE CRIPPLE

11:00-1:00. *Orthopedic Surgery* Operative Clinic. Abduction Traction Splint for Congenital Dislocation of Hip. C. C. VITALZ. (Roof Clinic—Capacity 60)
Shoulder Fusion for Polio Flail Shoulders, five year Follow-up. Demonstration of Cases. C. C. VITALZ. (Same Rm.)
Follow-up on Shelf Operation, for Congenital Dislocation of Hip. Presentation of Cases. J. GLANZKOPF. (Same Rm.)
Recurrent Clubfoot. Demonstration of Cases Following Resection of Head of Talus Plus Transplantation of Anterior Tibial Tendon. A. OAKER. (Same Rm.)
Demonstration of Cases Following Tereb Major Transplantation for Obstetrical Palsy. C. C. VITALZ. (Same Rm.)

JEWISH HOSPITAL

8:00-10:00. *General Surgery* Operative Clinic. PAUL W. ARCHER and STAFF. (Amph. 1—Capacity 35)
10:00-12:00. *Gynecology and Obstetrics* Nonoperative Clinic. Leo S. SCHWARTZ and STAFF. (Amph. 2—Capacity 35)
Postperal Hematomas of Vulva. PAUL FENKOWITZ. (Auditorium—Capacity 300)
Subcutaneous Heparin in Thromboembolic Disease in Gynecology and Obstetrics. HARRY J. GREENE. (Same Rm.)
A Study of Pelvic Drive in Obstetrics. EDWIN M. GOLD. (Same Rm.)
Hyaluronidase and Infertility. CHARLES BERNBERG. (Same Rm.)
Failed Forceps. LEONARD DACHMAN. WILLIAM POMERANCE. (Same Rm.)
Studies with Gonadotropin. SAMUEL A. WOLFE, IRWIN NEVINS. (Same Rm.)
10:00-12:00. *Gynecology and Obstetrics* Nonoperative Clinic
Diagnosis and Treatment of Solitary Cyst of the Kidney by Aspiration and Injection. ABRAHAM D. SOOAL. (Conference Rm.—Capacity 40)
Treatment of Hydrocoele by Sclerosing Agents. LOUIS H. BARRETT. (Same Rm.)
Periostitis and Ostitis Pubis Complicating Urologic Procedures. ZACHARY R. COTTLER, SAMUEL PARMAS. (Same Rm.)
Structural Uropathy in Children. PERRY KATZEN. (Same Rm.)
uric Acid Phosphatase in the Diagnosis and Management of Carcinoma of the Prostate. LEONARD KIMMEL, PAUL W. ARCHER. (Same Rm.)

KINGS COUNTY HOSPITAL LONG ISLAND COLLEGE DIVISION

8:30-1:00. *General Surgery* Operative Clinics
Gastric Resection. EDWARD P. DUNN. (B Bldg. O.R. 1-10—Capacity 30)
Large Bowel Resection. CHARLES B. JONES. (Same Rm.)
Gall Bladder and Common Duct Exploration. PHILIP E. LEAR. (Same Rm.)
Ligation Patent Ductus Arteriosus. JOHN L. MADDEN. (Same Rm.)
1:45-3:00. *General Surgery* Nonoperative Clinics
Diagnosis and Treatment of Lymphogranuloma Vene reum, Anus Rectum, and Colon. CHARLES B. JONES. (Nurse's Home Classroom—Capacity 50)
Paraduodenal Hernia, Report of Four Cases. PHILIP E. LEAR. (Same Rm.)
Cosmetic Incision for Excision of Benign Breast Tumors and for Supportive Dissection of the Female Breast. GUSTAVO T. DE TOANMA. (Same Rm.)
Tetanus—A Surgical Problem. Experience with Five Hundred Cases in China. PHILLIPS F. GREENE. (Same Rm.)
Gastrojejunocolic Fistula. Six Case Reports. JOHN L. MADDEN. (Same Rm.)
Follow-up Results in Hip Nailing Operations in Femoral Neck. ARNOLD F. SANDLER. (Same Rm.)

LONG ISLAND COLLEGE HOSPITAL

- 9:00-10:00. *Obstetrics and Gynecology* Operative and Non-operative Clinics, and Demonstrations. Members of the staff. (Surg. Amphitheater—Capacity 100)
The Departments of Ophthalmology and Otolaryngology will conduct their programs in the Brooklyn Eye and Ear Hospital.

METHODIST HOSPITAL

- 9:00-10:00. *Obstetrics and Gynecology* Operative Clinics
Vaginal Hysterectomy Total Hysterectomy (Other Operative Procedures to be Scheduled Later) G. H. DAVIS and STAFF (Buckley Bldg.—8th Fl., Mat. O.R. 1-6—Capacity 50)
9:00-10:00. *Obstetrics and Gynecology* Demonstrations
Ball Technique in X-Ray Measurement of Pelvis. J. I. BUTLER, E. GOVAKES. (Maternity Bldg.—Main Fl., Prenatal Clinic—Capacity 40)
Cord Transfusion. B. MATYER. (Same Rm.)

- Inspection of Clinics, Wards and Delivery Room.
RESIDENT STAFF (Same Rm.)
1. Interesting Cases. B. A. G. WENZ.
Maternal Mortality and Morbidity in Obstetrics. I. SEEMAN (Same Rm.)
11:00-12:00. Luncheon at the Hospital.
12:00-1:00. *Obstetrics and Gynecology* Nonoperative Clinic
G. H. DAVIS, Chairman.
Fibroids and Ovarian Tumors Complicating Pregnancy
G. SIMPSON. (Nurse's Auditorium—Capacity 100).
Fetal Mortality in Prolonged Labor. M. C. GARY (Same Rm.)
Leimyosarcoma, Contract with Cellular Myofibrosarcoma. W. G. FLEMING, J. S. HOWE. (Same Rm.)
Abatto Placentae. A. R. BEIL. (Same Rm.)
Manual Removal of Placenta. H. MATYER. (Same Rm.)
Anesthesia in Cesarean Section. H. ACHER, JR. (Same Rm.)
Wedge Resection of Ovary for Polycystic Disease. S. C. HALL. (Same Rm.)

CLINICS IN NEW YORK HOSPITALS

Friday

BEEKMAN DOWNTOWN HOSPITAL

- 9:30-10:45. *Traumatic Surgery* Nonoperative Clinic
Ward Fracture Rounds. ROBERT H. KENYON and STAFF (Wards in groups of 5-6. Total Capacity—30)
9:45-10:00. *Traumatic Surgery* Nonoperative Clinic
Case Presentation of Late Bad Results in Fractures. ROBERT H. KENYON and STAFF (3rd Fl. Annex—Capacity 30)

BELLEVUE HOSPITAL—FIRST (COLUMBIA UNIVERSITY) SURGICAL DIVISION

- 8:00-10:00. *Thoracic Surgery* Operative Clinic. FRANK B. BERRY and STAFF (C & D Bldg., 5th Fl.—Capacity 1)

BELLEVUE HOSPITAL—THIRD (NEW YORK UNIVERSITY) SURGICAL DIVISION

- 8:00-10:00. *Anesthesiology* Demonstration. Anesthesia in Thoracic Surgery. E. A. ROVENSTINE and STAFF (C & D Bldg., 5th Fl.—Capacity 5)

BELLEVUE HOSPITAL—FOURTH (NEW YORK UNIVERSITY) SURGICAL DIVISION

- 8:00-9:30. *General Surgery and Fractures* Operative Clinics. (O.R. K-5 & K-6) ARTHUR McQUELLAN and STAFF (Capacity each operating room, 5)
Thyroid Surgery. ARTHUR S. McQUELLAN (O.R. A)
Stomach Surgery. J. WILLIAM HINTON. (O.R. B)
Intestinal Surgery. LESTER BRIDENBACH. (O.R. C)
Gall-Bladder Surgery. EDWARD V. DICKENSON (O.R. D)
Smith-Petersen Nailing for Fracture of Neck of Femur. KENNETH M. LEWIS (Bones Room K-6)
9:00-10:00. *General Surgery and Fractures*. Nonoperative Clinics (End Results). ARTHUR S. McQUELLAN and STAFF (1 & K Bldg., Stewart Amphitheater—Capacity 100)
Thyroids. ARTHUR S. McQUELLAN
Peptic Ulcers. J. WILLIAM HINTON
Fracture of the Neck of the Femur. KENNETH M. LEWIS
Stricture of Rectum Due to Lymphogranuloma Venereum. LESTER BRIDENBACH
Gall-Bladder Disease. EDWARD V. DICKENSON

BETH ISRAEL HOSPITAL

- 9:00-10:00. *Orthopedic Surgery* Nonoperative Clinic.
IRVING BALDOWITZ and STAFF (3rd Fl. Lecture Rm.—Capacity 30)
10:00-11:00. *Obstetrics* Nonoperative Clinic. EDWIN G. LAMOROCK, SAMUEL J. SCARBOROUGH. (Same Rm.)
11:00-12:00. Nonoperative Clinic. Tumor Clinic. ALBERT FLAUT and STAFF (Auditorium—Capacity 100)

FLOWER AND FIFTH AVENUE HOSPITALS

- 9:00-10:00. *General Surgery* Nonoperative Clinic. Water Balance, etc. FRANCIS D. SPIER, JOHN HENSLY (Auditorium—Capacity 100)
Lymphoid Amino Acids. MICHAEL G. MITCHELL (Auditorium—Capacity 100).
Relationship of Amino Acid Composition of Foods. R. J. BLOCK, H. H. MITCHELL. (Auditorium—Capacity 100)
10:00-11:00. *General Surgery* Nonoperative Clinic. The Prevention of Renal Complications by Therapy with Mixtures of Sulfonamides—or—Phthalyl Sulfonamides in Surgery of Colon. DAVID LERN. (Auditorium—Capacity 100)
11:00-12:00. *General Surgery* Nonoperative Clinic. Presentation of Plans for Resident Training in Surgery. JAMES M. WRIGHT. (Auditorium—Capacity 100)

HARLEM HOSPITAL

- 9:00-10:00. *General Surgery*. Operative and Nonoperative Clinic. Abdominal Catastrophes. B. N. BROWN, A. A. ZINGARD, J. L. WILSON, A. DELL, MAYNARD. (Mills Bldg. O.R.—Capacity 5 or and Gyn. O.R. Women's Pavilion—Capacity 1 & Conference Rm. 5th Fl. Women's Pavilion—Capacity 25). (Ward Rounds will be held on 3d and 5th)
10:00-11:00. *General Surgery* Nonoperative Clinic. Climatological Conference. L. T. WRIGHT, S. WINTHROP and STAFF (Conference Rm. 5th Fl. Women's Pavilion—Capacity 50)

HOSPITAL FOR JOINT DISEASES

- 9:00-10:00. *General Surgery* Operative Clinic. Carcinoma of Colon. Carcinoma of Rectum. Nonoperative Clinic.

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Intra Abdominal Resection with Anastomosis for Carcinoma of the Rectum. A. J. BELLER. (Surg. Amphitheater—Capacity 50)
 2:00-4:00. *Neurosurgery* Operative Clinic Operations of Brain and Spinal Cord. ABRAHAM KAPLAN (Same Rm.)

HOSPITAL FOR SPECIAL SURGERY
 8:30-12:00. *Orthopedic Surgery* Operative Clinic. Adult Service. PHILIP D. WILSON, R. STEPHENS and STAFF (Main O.R.—Capacity 35)
 2:00-5:00. *Orthopedic Surgery* Nonoperative Clinic (Lecture Hall—Capacity 100)
 Osteoid Osteoma. MILTON HILFELMAN, RAYMOND LEWIS.
 Bone Grafts without Internal Fixation. PETER RIZZO.
 Bridging of Defects of Long Bones of the Extremities. JOHN FLAMAGAKI.
 The Bone Bank. PHILIP D. WILSON
 Spine Fusion with Internal Fixation. L. RAMSEY STRAUSS.
 Problems in the Treatment of Scoliosis. JOHN R. COBB

LENOX HILL HOSPITAL
 9:00-11:00. *Gynecology* Operative Clinic. ROYAL VAN ETTEN and STAFF (O.R. 1, 2 & 3—Capacity each 15)
 11:00-12:00. *Gynecology* Nonoperative Clinic. Hystereotomy Combined Method with Lantern Slides. MORRIS ROODMAN. (Elmhurst Auditorium—Capacity 450)
 2:00-5:00. *Orthopedic Surgery* Nonoperative Clinics Late Results of Unusual Cases
 Osteoarthritis of the Hip in the Aged Treated by Bilateral (Elmhurst Auditorium—Capacity 450)
 Spinal Fusion for the Unstable Spine Giant Cell Tumors of Bone. WALTER SWIFT (Same Rm.)
 Combined Internal External Splitting of Fractures by the Roger Anderson Technique. HENRY JORDAN (Same Rm.)
 Bilateral Epiphysiolysis Capitis Femoris (Slipping of the Upper Femoral Epiphyses). FRANCIS ROTUN. (Same Rm.)
 Inspection of Lenox Hill Brace Shop.

LYING-IN HOSPITAL
 (See New York Hospital)
 MANHATTAN EYE, EAR AND THROAT HOSPITAL

9:30-12:00. *Otolaryngology* Nonoperative Clinic. Demonstration Audiometry; Selection and Fitting of Hearing Aids. Retaining Radical Hearing. WILHELMUS NEEBBERG. (Jones Clinic, 2nd Fl.—Capacity 24)
 12:00-1:00. *Ophthalmology* Nonoperative Clinic. Demonstration Corneal Grafting Technique on Rabbits. H. M. KATZ. (Eye Bank Lab., 10th Fl.—Capacity 12)
 1:00-2:00. *Neurosurgery* Operative Clinic. Facial Nerve Graft Operation and Demonstration of Postoperative Results. T. G. THOMAS. (O.R. 6th Fl.—Capacity 5)
 2:00-4:00. *Otolaryngology* Operative Clinic. Tumors Surgery Preoperative and Postoperative Procedure. R. J. BELLER. (O.R. 7th Fl.—Capacity 5)
 2:00-5:00. *Ophthalmology* Nonoperative Clinic. Orthoptic Clinic. F. C. KURT, JR. E. KRAUZE. (1st Fl. Room—Capacity 12)

MEMORIAL HOSPITAL
 9:00-10:30. *Tumor Surgery* Nonoperative Clinic. End Results Following Abdominoperineal Resection for

Cancer of the Rectum. Treatment of Cancer of the Colon, Management of Squamous Cancer of the Anus and the Rectum. G. E. BINKLEY (Auditorium—Capacity 250)
 10:30-12:00. *Tumor Surgery* Nonoperative Clinic. End Results in the Treatment of Cancer of the Stomach and Esophagus. GEORGE T. PACK, ISABEL M. SHARAGALL. (Same Rm.)
 2:00-5:00. *Thoracic Surgery* Nonoperative Clinic. Asymptomatic Thoracic Tumors. End-Results in Surgically Treated Cases of Carcinoma of the Cervical Esophagus. WATSON. (Same Rm.)
 3:00-4:00. *Tumor Surgery* Nonoperative Clinic. End-Results in Treatment of Bone Tumors. B. L. COLLEY. (Same Rm.)
 4:00-5:00. *Tumor Surgery* Nonoperative Clinic. Discussion. Cancer in Children. Presentation of Followed Cases. H. W. DANZON. (Same Rm.)

METROPOLITAN HOSPITAL
 9:00-12:00. *General Surgery* Operative Clinic. Surgery of Stomach and Duodenum. JAMES M. WHITEHEAD and STAFF (Conference Rm.—Capacity 60)
 Indications. EDWARD J. MCCART. (Same Rm.)
 Vegetation. JAMES M. WHITEHEAD. (Same Rm.)
 Duodenal Closure and Complications. KENNETH C. PRACOCK. (Same Rm.)
 Surgery of Gall Bladder and Pancreas. KENNETH C. PRACOCK. (Same Rm.)
 Retroperitoneal Tumors. KENNETH C. PRACOCK, JOHN SWIDER. (Same Rm.)
 Peritoneal Spaces. JOHN HERRLIN. (Same Rm.)
 2:00-4:00. *Plastic and Reconstructive Surgery* Operative and Nonoperative Clinic. Plastic Clinic. DAVID M. MAYER, JOHN F. FORD. (Main O.R. 1—Capacity 30)

MOUNT SINAI HOSPITAL
 8:30-12:00. *Genitourinary Surgery* Operative Clinic. Kidney Operation. LEO EDELMAN. (Surg. Amphitheater—Capacity 100)
 Nonoperative Clinic. Carcinoma in a Horseshoe Kidney. GORDON D. OPPENHEIMER. (Same Rm.)
 Bladder Neck Obstruction in Young Individuals. MORRIS SWICK. (Same Rm.)
 Peritoneal Insufflation. WILLIAM MENCHER. (Same Rm.)
 Enureals Due to Ectopic Ureter. H. EVANS LITTELL. (Same Rm.)

NEUROLOGICAL INSTITUTE
 (See Presbyterian Hospital)
 NEW YORK EYE AND EAR INFIRMARY
 10:00-12:00. *Otolaryngology* Demonstration Anatomical Specimens. J. SWIFT HANLEY. (Weeks Hall—Capacity 100)
 2:00-4:00. *Otolaryngology* Discussion of Pathology with the routine clinics of the New York Eye & Ear Infirmary will be held as usual during this period. All Fellows of the American College of Surgeons are cordially invited to attend.

NEW YORK HOSPITAL
 9:00-12:00. *Orthopedic Surgery* Operative Clinic. FREDERICK LEE LIEBOWITZ. (10th Fl. O.R., 1 Rm.—Capacity 30)
 2:00-5:00. *Orthopedic Surgery* Nonoperative Clinic. FREDERICK LEE LIEBOWITZ and ASSOCIATES

Segmental Arterial Spasm Associated with Supracondylar Fracture of the Elbow (Case Report) ARTHUR COV 301E. (Rm. F-630—Capacity 70)
 Reconstruction Surgery of the Hand (Lantern Slides) FREDERICK L. LIEBOWITZ (Same Rm.)
 Massive Oolay Bone Grafts for Ununited Fractures. PETERSON WARE (Same Rm.)
 Conservative Treatment of Tibial Fractures of the Tibia. IRVING M. MANSUR (Same Rm.)
 End-Results in Treatment of Fractures of the Neck of the Femur by Moore Nails. NELSON CORVELL (Same Rm.).

1200-1300. *Otolaryngology* Operative Clinic Surgery of the Oropharynx and Nasopharynx THOMAS GAR RICK. (10th Fl. O.R., Rm.—Capacity 30)
 100-300. *General Surgery* FRANK GLENN and STAFF
 The Chemistry of Penicillin and Streptomycin VINCENT DO VONTECH. (College Auditorium, Rm. B-00—Capacity 350)
 Toxicity of Streptomycin W. LUI McDERMOTT (Same Rm.)
 Treatment of Pulmonary Tuberculosis by Streptomycin CARL MUECHENHEIM (Same Rm.)
 Use of Streptomycin in Treating Surgical Pulmonary Tuberculosis. CRANSTON HOWE (Same Rm.)
 Adult Thorax Extract in Wound Healing JAMES DUNWALL (Same Rm.)

NEW YORK HOSPITAL LYING-IN HOSPITAL

900-1000. *Gynecology* Operative Clinic Gynecological Operations by RESIDENT STAFF (GYN O.R. Rm.—Capacity 50)
 1200-1300. *Obstetrics and Gynecology* Operative Clinic Obstetrical and Gynecological Staff Rounds. GORDON DOW LAY and STAFF (Wards—Capacity 3)

NEW YORK ORTHOPEDIC DISPENSARY AND HOSPITAL

800-1000. *Orthopedic Surgery* Operative Clinic ALAN DE FOREST SMITH and STAFF (O.R. &—Capacity 3)
 30-400. *Orthopedic Surgery* General Orthopedic Clinic HALFORD HALLOCK and STAFF (7th Fl. Assembly Rm.—Capacity 30)

NEW YORK POST-GRADUATE MEDICAL SCHOOL AND HOSPITAL

330-400. *General Surgery* Operative Clinic. R. B. LOBBMAN (O.R.—Capacity 3)
 Operative Clinic J. W. HINTON (Surg. Amphitheater—Capacity 3)
 830-1200. *Plastic Surgery* Operative Clinic GUST AVENHART (O.R.—Capacity 1)
 930-1200. *Ophthalmology* Nonoperative Clinic Muscle Anomalies of the Eye with Demonstration of Cases HAROLD W. BROWN (Eye Clinic—Capacity 3)
 30-1200. *General Surgery* Nonoperative Clinic. Thyroid Disease, Including Case Presentations and Discussion of Thyroid Therapy. Carcinoma of the Thyroid, and Anatomical Consideration of the Recurrent Laryngeal Nerve. LOUIS R. SLATTERY RALPH R. MOOREHEAD (Erdmann Auditorium—Capacity 3)
 100-300. *General Surgery* Operative Clinic J. R. KRAMM (O.R. 4—Capacity 1)
 Operative Clinic C. G. HIRT. (Surg. Amphitheater—Capacity 30)
 100-300. *Tumor Surgery*. Operative Clinic. H. W. MYER. (O.R.—Capacity 3)

2200-3200. *Gynecology* Operative Clinic. W. T. DAY. KRUMHOLTZ. (O.R. 3—Capacity 1)

PRESBYTERIAN HOSPITAL

800-1200. *General Surgery* Operative Clinics Surgery of The Large Bowel. Surgery of the Rectum (Amoel). DAVID C. BULL, ROBERT S. GRINDLELL, LOUIS M. ROUSSELOT HENRY S. COOPER. (10th Fl. Main O.R. A II—Capacity each 6)
 Vagotomy for Marginal Ulcer ROBERT H. WITTE (Same Rm.)
 Wiring of Arteriosclerotic Abdominal Aorta. ARTHUR H. BLACKMORE. (Same Rm.)
 100-400. *General Surgery* Nonoperative Clinic. Physiology of Peritonitis. JOHN S. LOCKWOOD. (8th Fl. McCord Amphitheater—Capacity 143)
 Prevention of Wound Infection and Peritonitis with Sulfanilylon and Streptomycin. Case Demonstration EDWARD L. HOWER.
 Laboratory Experiments and Clinical Results with Bacitracin FRANK L. MULLONEY
 Observations on Acute Appendicitis Over a Thirty Year Period at University Hospital. ROBERT A. SCOTT. LINDEN

PRESBYTERIAN HOSPITAL NEUROLOGICAL INSTITUTE

900-1200. *Neurosurgery* Operative Clinic Cases Previously Seen. Clinically at the Monthly Morning Staff Conference. Surgical Staff. (10th Fl. V.L.-O.R. 1—Capacity 2 O.R. 2—Capacity 6)

PRESBYTERIAN HOSPITAL SLOANE HOSPITAL FOR WOMEN

900-1000. *Obstetrics and Gynecology* Nonoperative Clinics: Implantation of Radiators for Carcinoma of the Cervix. JAMES CORCORAN, S. GORDON. (7th Fl. Lecture Rm.—Capacity 4)
 100-200. *Obstetrics and Gynecology* Nonoperative Clinic. Late Follow-up Results in Carcinoma of the Cervix. JAMES CORCORAN (Same Rm.)
 100-300. *Obstetrics and Gynecology* Nonoperative Clinic Trends in the Treatment of Uterine Carcinoma. HOWARD C. TAYLOR, JR. (Same Rm.)

PRESBYTERIAN NEW YORK ORTHOPEDIC HOSPITALS

Fracture Service
 900-1000. *Fractures and Traumatic Surgery* Nonoperative Clinic. Fracture Service Grand Rounds and Conference. FRACTURE SERVICE STAFF (Fresh Hop Ortho Wards, 10th Fl. W.—Capacity 30)
 100-400. *Fracture and Traumatic Surgery* Nonoperative Clinic. Role of Sympathetic System in the Surgery of Trauma. STEPHEN S. HUNTER. (Rm. 47 6th Fl. Phys. & Surg. Bldg.—Capacity 60)
 Use of Amino Acids in Maintaining Nitrogen Balance. SIDNEY C. WALKER. (Same Rm.)
 The Treatment of Shock Colloid. 10th Trauma JOHN SCUDDER. (Same Rm.)

ROOSVELT HOSPITAL

900-1000. *General Surgery* Nonoperative Clinics: Tumors of the Stomach With Colored Photographs of Specimens. HOWARD A. PATTERSON. (Conference Rm. 1—Capacity 30)
 Demonstration of Stomach Tumor Specimens. WALLACE BRAMMER. (Conference Rm.—Capacity 30)
 Some Late Results of Conservative Treatment in Vascu-

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lar Problems. GRANT P. PENNOVER. (Conference Rm. 1—Capacity 50)
The Observed Effect of Various Drugs on Intestinal Activity. Motion Picture Demonstration. DAVIN M. WEXLER. (Conference Rm. 1—Capacity 50)

ST VINCENT'S HOSPITAL

9:00-12:00. *General Surgery* Operative Clinics and Demonstration Cases of Trauma Fractures. C. J. MAQUETTE, FRANK CONWAY, LOUIS SAMMAN, JOHN A. FALLON, MAURICE O'SHEA. (O. R. A & B—Capacity each 5 O. R. C—Capacity 10)

9:00-12:00. *General Surgery* Tumor Clinic and Follow-up. Auditorium—Capacity 150
9:00-12:00. *Anesthesiology* Nonoperative Clinic. The Results of Conservative Treatment of Acute Head Injuries. FRANKLIN ROBINSON. (Nurse's Lecture Rm.—Capacity 60)

12:00-4:00. *Pathology* Nonoperative Clinic Display of Fresh Pathological Material. Display and Demonstration of Systemic Diseases by Kodachrome Slides and of Fixed Specimens. ARTHUR ROTTINO and ASSOCIATES. (Same Rm.)

SLOANE HOSPITAL FOR WOMEN (See Presbyterian Hospital)

U. S. MARINE HOSPITAL (STATEN ISLAND)

10:00-12:30. *General Surgery* Nonoperative Clinic Esophageal Hypertension—Combined Medical, Surgical, and Anesthesiology Presentation. H. L. SKINNER, C. L. HERBERT and STAFF. (Doctor's Staff Rm.—Capacity 75)

12:30-1:00. Luncheon at the Hospital
1:00-2:00. *General Surgery* Operative Clinic Dorsolumbar Sympathectomy—Intrathecal Anesthesia. H. L. SKINNER and STAFF. (General O. R.—Capacity 10)

1:00-3:00. *Genitourinary Surgery* Nonoperative Clinic Genitourinary Surgical Ward Rounds. CHARLES FERGUSON and STAFF. (Ward E.F. 6—Capacity 20)

VETERANS ADMINISTRATION HOSPITAL

9:00-12:00. *General Surgery* Operative Clinic. CARMES WEEKS, JOHN E. SULLIVAN. (Bldg. D 12th Fl. 1 Rm.—Capacity 10)

9:00-12:00. *Thoracic Surgery* Operative Clinic. WALTER CHAMMALL, AARON HUMMELSTEIN, RICHMOND MOORE. (Bldg. D, 12th Fl. 1 Rm.—Capacity 10)

9:00-12:00. *Orthopedic Surgery* Operative Clinic. SYDNEY EICHENMOLZ, ROBERT PATTERSON, FRANK E. STERN. (Bldg. D, 12th Fl. 1 Rm.—Capacity 10)

9:00-12:00. *Head and Neck Surgery* Operative Clinic. EDGAR L. FRANKEL. (Bldg. D, 12th Fl. 1 Rm.—Capacity 10)

9:00-12:00. *Plastic Surgery* Nonoperative Clinics Plastic Surgery. HERBERT CONWAY, CLARENCE R. STRAATMAN, CONNELL J. KRAEHL, ROBERT H. CLIFFORD and RESIDENT STAFF
Cases Demonstrating the Use of Large Abdominal Crossed Leg Flaps. (Bldg. A, 3rd Fl.—Capacity 200 Rm.)

Plastic Surgery in Cancer of the Head and Neck. (Same Rm.)
9:30-12:30. *General Surgery* Nonoperative Clinic Medical Rehabilitation Clinic. HARRY KIEHLER, KARL HANFUDER, IRWIN D. STEIN, HERMANN STOLL, and JACOB BYER. (Bldgs. B, C, & F Ground Fl.—Capacity 20)

11:00-12:30. *General Surgery* Nonoperative Clinic: Thoracolumbar Sympathectomies. CARMES WEEKS. (Bldg. A, 3rd Fl.—Capacity 200)
12:30-3:30. *Radiation Therapy* Nonoperative Clinic Exhibit and Presentation Bronchogenic Carcinoma—Analysis of Diagnosis and Therapy with End-Results. A Study of 600 Cases. ARTHUR SIEGEL, BERNARD ROSEN, JOSEPH STEIN and RESIDENT STAFF. (Bldg. A, 3rd Fl.—Capacity 200)

3:30-5:00. *Anesthesiology* Nonoperative Clinics Conference Endotracheal Anesthesia. Electrocardiographic Changes during Intrathoracic Surgery. EMORY ROYENITZ, HAROLD BISHOP, CHARLES BORSTEIN and RESIDENT STAFF

EXHIBITS

(Bldg. A, 3rd Fl.)

Anesthesia Section
Bronchogenic Carcinoma
Review of 600 Cases
Intracranial Neoplasms
Residency Training Program
Organization of Surgical Division
Results of Vagus Resection
Pathology Section
Medical Illustrations
Laboratory
Plastic Surgery
Prosthetic Appliances

WOMAN'S HOSPITAL

8:30-12:30. *Obstetrics and Gynecology* Nonoperative Clinics ALBERT ALDRIDGE and STAFF. (4th Fl. Conference Rm.—Capacity 75)
Treatment of Neoplasms of the Female Genital Tract.
Management of Birth Injuries and Uterine Displacement.
Diagnosis and Treatment of Obstetric Complications.
End Results of Treatment of These Conditions Will Be Discussed.
During the course of the morning the routine for training of Residents in Gynecology and Obstetrics will be outlined.
The pathologist will give demonstrations of obstetric and gynecologic pathological specimens.

CLINICS IN BROOKLYN—LONG ISLAND HOSPITALS

Friday

CUMBERLAND HOSPITAL

9:00-12:00. *General Surgery* Operative Clinic Cancer and Prostate. HOWARD T. LANGWORTHY and STAFF. (O. R. 1 & 3—Capacity 20)
Orchiectomy for Prostatic Metastases. Late Results. LEO DREZLER. (Auditorium—Capacity 300)

Cancer of Bladder with Transplantation of Ureter. Late Results. LEO DREZLER and STAFF
9:00-12:30. JOSEPH J. ANTON
9:00-3:00. *Nonoperative Clinic*. Late Results in Thrombophlebitis and Phlebotrombosis. WARD CHILLY Tumors in Children. HERMAN CHACHACH.

Convulsions During Anesthesia. Lat. Results. I video
M. PALLIN

KINGS COUNTY HOSPITAL

- 9:00-1:00. *Gynecology* (Kings County Division) Operative Clinics. GARLICK, MCGOLDRICK and MUELLER. (B Bldg. O R. 1-10—Capacity 3)
- 9:00-1:00. *Thyroid Surgery* Operative Clinic Thyroidectomy. ARTHUR PERUDONT. (Same Rm.)
- Nonoperative Clinic: Use of Propyl Thiouracil. (T follow in O R.) (Same Rm.)
- 9:00-1:00. *General Surgery* Nonoperative Clinic JOHN F. RAYCHOTT and STAFF
- Cholecystectomy in the Acute Gall Bladder as Compared with Cholecystectomy in the Chronic Gall Bladder. IRWIN P. TRAM. (O P D Bldg. Lecture Rm.—Capacity 50)
- Use of the Miller Abbott Tube As an Aid in Intestinal Surgery. JOHN F. RAYCHOTT. (O. P. D. Bldg., Lecture Rm.—Capacity 50)
- Review of Gastric and Duodenal Surgery. HARVEY F. POTTER. (Same Rm.)
- Fracture of the Neck of the Femur—Five year Study with Follow-up. VINCENT S. MAURO. (Same Rm.)
- Case Report. Congenital Idiopathic Distention of the Common Bile Duct. JOHN F. RAYCHOTT. (Same Rm.)
- Review of Amputations of the Lower Extremities. THOMAS W. HINES. (Same Rm.)

Review of Acute Appendicitis. PETER FRIEL. (Same Rm.)

Review of Large Bowel Surgery. BERNARD J. FRIEDL. (Same Rm.)

Therapy of Peripheral Vascular Disease. C. HIRSH. ROSEN. (Same Rm.)

2:00-5:00. *Gynecology* Nonoperative Clinic: Follow-up of Gynecologic Malignancies. JOSEPH MCGOLDRICK. (Main Bldg., Rm. B-3—Capacity 50)

LONG ISLAND COLLEGE HOSPITAL

- 9:00-1:00. *General Surgery*
- Operative Program. LEO GOSTICK and STAFF. (Surg. Amphitheater—Capacity 100).
- Nonoperative Clinic: Fractures and Other Trauma. S. POTTER BARTLEY HAROLD LARON. (Surg. Amphitheater—Capacity 50)
- Nonoperative Clinic: Diagnostic and Therapeutic Nerve Blocks. PAUL AMERRO. (Surg. Amphitheater—Capacity 100).
- The Departments of Ophthalmology and Otolaryngology will conduct their programs at the Brooklyn Eye and Ear Hospital.

METHODIST HOSPITAL

- 9:00-1:00. *Tumor Surgery* Nonoperative Clinic: Tumor Clinic (Late Results). PIERRE A. RICHARD, Moderator and Hospital Staff. (Nurse Auditorium—Capacity 500)

September, 1947

SURGERY
GYNECOLOGY AND OBSTETRICS
Supplement

INTERNATIONAL ABSTRACTS
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COLLECTIVE REVIEW

THE DEVELOPMENT OF THE CONCEPT OF ANTISEPSIS AND ASEPSIS FROM LISTER TO WORLD WAR II

H WINNETT ORR M.D., F.A.C.S., Lincoln Nebraska

MANY surgeons before Lister had observed the primary healing of wounds. Some of them had envisioned universal recovery from traumatic injuries and surgical operations if only the cause of local inflammation and the systemic hospital fevers could be found. But most prelisterian surgeons had become reconciled to pyemia, septicemia and hospital gangrene as being inevitable except in those patients who by some providential dispensation over which the surgeon had no control, escaped. Some thought the so-called hospital diseases were caused by miasmas in certain neighborhoods by the polluted air in the vicinity of graveyards or where there had been much disease as in hospitals. The outstanding surgeon John Erichsen (one of Lister's teachers) advocated the tearing down or burning of hospitals in which erysipelas and gangrene were prevalent. He said it was as impossible to rid them of contagion as to stop the fermentation in a cheese.

The Lister antiseptic system did not spring all at once fully developed from the mind of the inventor. Like most medical and surgical discoveries the antiseptic system developed gradually and not even always consistently during the years both before and since Lister promulgated his idea in 1867. What Lister saw that others did not see was that chemicals might be employed to keep the out of injuries and surgical wounds. He did not at first employ a chemical in the ordinary wounds and sores that every doctor and every surgeon sees in his practice. In a course of lectures that he

gave at the University in Glasgow he referred to the fact that in private practice he was still using the water dressing. But he said that he used carbolic acid in the hospital not so much for the benefit of the sores themselves as for producing as much purity as possible in the hospital wards to keep the causes of putrefaction out of wounds and to limit putrefaction when present to the original victims.

In referring to this matter Lister indicated that he foresaw the time when with clean wounds it might be possible to sew them up and have them heal by primary intention that is, without any wound complications inflammation, or suppuration whatever. Lister set this idea aside however at that time for the reason that he could not imagine the use of any chemical to sterilize the wound or to make the wound sufficiently clean for primary closure without too much damage to the tissues. Lister had constantly before him the cases in which extensive suppuration inflammation, and other hospital diseases (to which we have referred) were present. He realized that to sew up or close wounds might cause surgical complications and deaths and that this danger could never be disregarded if suppuration fermentation and putrefaction had not been avoided at the beginning.

On the other hand Lister feared the effects of antiseptics applied directly to the wound surface. He had not arrived at the point where he could foresee or understand the prevention of surgical infections by aseptic methods, that is, the keeping out of germs by sterile dressings, rubber gloves,

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*Clinical notes at bedside of
Prof Lister with note of
him in the clinical
wards of the R.N., at Belfast
May Jan 1870*

*Edinburgh & L. M. J. Gazette
Session 1870/71*

Fig. 3

Novum Lumen Chirurgicum
OR A
NEW LIGHT
OF
CHIRURGERY

Wherein is Discov'ed

A much more Safe and Speedy
way of Curing *WOUNDS*
than has heretofore bin usu-
ally practis'd

*Illustrated with several Experiments made in
Flanders in the Year 1694*

By JOHN COLBATCH, a
Member of the College of Physicians

LONDON,
Printed for Dan Brown, 1704

Fig. 3.

is only an adaptation and extension of normal nu-
trition.

With the great improvement in results that took
place in surgical practice generally after the anti-
septic system became popular it is not astonish-
ing that other useful surgical expedients came to
be neglected. One felt that with infection under
control results were so much better that they
were good enough. Also surgeons, as doctors often
do, fell into the error of supposing that every im-
provement in the patient's condition following the
use of the antiseptic was due to the chemical agent
employed. They forgot, as Gamgee and others
had pointed out that

'Life and putrefaction are not correlative, but
antagonistic and in proportion as the surgeon
finds and economises the attributes of life he will
find himself independent of those changes which
are inherent to decaying organic matter whether

pression dressing to which he had already given
the name of hyponarthesis. Gamgee reported a
series of more than 100 general surgical cases treat-
ed without using Lister's method and with less
than 3 per cent mortality. He referred to the
simple methods of operation and dressing by Barn-
Larrey who did 14 shoulder amputations in the
battle field with only 2 deaths. This was in con-
tention in the fact that such methods as com-
pression or wound protection drainage, and rest
gave patients an opportunity to recover before the
days of antiseptics. At the same time it must be
remembered that in Lister's own wards at Glas-
gow before antiseptic methods were employed
and when irrigations frequent dressings and sep-
tas were general the death rate in all ampu-
tations even fingers was from 50 to 75 per cent.

It was very easy for Gamgee to adjust and adapt
the wound dressing method with which he was al-
ready familiar and which he had been teaching
to the germ theory of wound infection and putre-
faction. This is indicated as well as anywhere in
Gamgee's 'Treatment of Wounds and Fractures,'
published in London in 1883. In an article
2 p 813 (Philadelphia ed. 1886) he amplified
and clarified his views somewhat further to indi-
cate exactly where he stood on the Lister antisep-
tic method. Gamgee wrote 'Antiseptics have so
far only been mentioned incidentally but the
materials recommended for the wound-dressings
such as borax and glycerine tincture of benzoin
styptic colloid, and collodion are in eminent de-
gree antiseptic. The question in wound treatment
is not one of antiseptics or no antiseptics but of
the form and proportion in which they should be
employed in particular conditions. The great an-
tiseptic is life. The living tissues have a natural
preservative power which if guarded and con-
served by the surgeon on physiological principles
offers the surest guarantee for healthy repair which

C A E S A R I S
M A G A T I
S C A N D I A N E N S I S
IN ALMO FERRARIENSI GYMNASIO
Publicae Medicinae Professor
DE RARA MEDICATIONE VULNERVM
Juxta de Valsalva non antiqua,
LIBRI DVO
IN QVIBVS NOVA TRADITAE METHODVS
quae folio 1^o et 2^o nonnulla quae nonnulla (sanctissimi) Valsalvi
Opusculum promissum est, et perfectum operum cunctarum rationem, diligenter
examinare, pertractare, explicare, et de Valsalva loca adhibere.
HAC AVTEM DVBI QVAESTIONE
1. Per se videtur si ratione pendeat, si praeferat, si plures rationes debet
2. Per se videtur, si praeferat, si praeferat, si praeferat, si praeferat
NOVVM ARGVMENTVM EST A NVLLIO HACTENVS
rationem, sed praeferat, et de Valsalva loca adhibere, et de Valsalva loca adhibere.
Adhuc hanc rationem
IOANNIS BAPTISTAE MAGATI
Tactum, quae de Valsalva loca adhibere, et de Valsalva loca adhibere.
Conceptus habet Caput, et de Valsalva loca adhibere, et de Valsalva loca adhibere.



VENETIIS Aprilis die LXXVI. MDCCLXXVI
SVPERIORVM PERMISSV ET PRIVILEGIO

Fig

antiseptic preparation of the skin, covering of the surgeon's nose and mouth and the like for the better protection of the patient at the time of operation.

Lister explained, upon the occasion of one of these lectures (about 1870) that even in those days the surgeon did not undertake the removal of a tumor if he knew beforehand that he would be unable to close the wound and close the skin after the operation. Surgeons thought that any open wound was dangerous for the patient. Lister told of an experience in which he had excised a small epithelial cancer from an old lady's scalp: the edges of the wound could not be brought together. "Putrefaction" nearly caused her death but by good fortune she recovered.

He said "I determined from that very time to use antiseptic dressings to every raw surface." This indicated that, even then, he considered irritation of the wound surface by carbolic acid preferable to risking the danger of infection after operation. He did not appreciate fully the dangers of secondary infection at the time of changing dressings,

and the fact that such infections did occur (then as now) had not made its full impression upon him.

Regarding his view of the future and the possibility of performing aseptic operations, his exact words were as follows: "But then you might say theoretically that if you have some germ poisoner which will prevent decomposition and at the same time which would not irritate the surrounding tissues, we might sew up the edges of the wound closely together. Do we know of any material which would kill the germs without irritating the tissues? If we had such a substance we might then sew up the wound and apply some antiseptic dressing and reckon upon union by the first intention. That is theoretically the correct treatment of incised wounds. Have we any such antiseptic? No!" That was Lister's answer in 1870 and it is my answer now.

Regarding compound fractures, Lister said, "Fifteen cases of compound fracture were treated by my last house surgeon Dr. (Sir Hector) Cameron, and all of these men or women are living with all their limbs on." And in another place he said that it was worse than useless to syringe out a compound fracture with carbolic acid and not apply an antiseptic dressing. The effect of the acid would pass away in a few hours and the parts would be exposed to a worse irritation than if they had never been syringed with the antiseptic. Amputation at first would have been better.

This was the Listerian teaching. It was perfectly clear, perfectly comprehensible, and perfectly true, but it has not been understood or followed entirely by many of those who have undertaken the primary or the secondary closure of infected wounds. Those successes which have occurred following primary closure have not been attributed, as they should have been, to the resistance and powers of recovery in the patient, but to the agent employed, whatever that chemical happened to be.

Mr. Sampson Gamgee, a Lister contemporary in London, was one of those who protested against the adoption of the antiseptic method. He said that one may as properly speak of homeopathic medicine as of antiseptic or any other special kind of surgery. Gamgee was a well-trained surgeon who had visited other countries and knew their methods. He had seen Maisonneuve at the Hotel Dieu in Paris using antiputrescent lotion of 1 per cent carbolic acid to control wound infection. Debat said that Maisonneuve had used this since 1861 (6 years before Lister) constantly for wounds after an original demonstration by Debat himself. Gamgee was an advocate of the infrequent com-

T H B
Manner of Curing all
FRACTURES
AND
DISLOCATIONS,
Incident to
Humane **BODIES,**
By the Means of
BANDAGES

Compiled by *M Lawrence Verduc,*
Sworn Master Surgeon at Paris

L O N D O N,

Printed for S and J Sprint, J Nicholson,
in Little Britain, and A Bell and
R. Smith in Cornhill 1706.

Fig. 4.

it be in bagging wounds or boggy lands. (42
2 ed pp 185 186)

Lister began the antiseptic treatment of wounds with carbolic acid. Some of his early results were as good as any he or his successors ever attained. A point to which it seems important to call attention in this article is that Lister's later laboratory experiments with germ cultures, fermentation, and antiseptic chemicals had a confusing and distracting effect even upon him in his further application of the 'antiseptic principle' of wound protection which was his original idea.

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to what the infectious diseases were doing before we understood the relationship between germs and the epidemics of communicable disease.

In a way the surgery of the prelisterian era was a plague in itself. There were thousands of post-operative deaths from gangrene, erysipelas, tetanus, and gas bacillus infections. Surgery directly responsible for most of these was revolutionized just as was the control of tuberculous, typhoid fever and cholera, by Pasteur, Lister and Koch.

One of Lister's biographers, Cuthbert Dule pointed out that when a surgeon in those days had performed successfully the simplest operation, such as the amputation of a finger, he knew it might be followed by dangerous and even fatal consequences. Professor Volkmann at Halle made the remark that, before Lister when a surgeon closed the wound, he was "like a husbandman, having sown his field waits with resignation for what the harvest may bring and reaps it fully conscious of his own impotence against the elemental powers which may pour down upon him rain, hurricane, and storm."

One of the earliest effects of the introduction of the antiseptic system was to call attention to the fact that while deaths caused by sepsis and infection were common following operations in private homes, the results were far worse when patients were operated upon in hospitals. We know now that infection was carried from one patient to another and that tetanus, erysipelas, gangrene, and septicæmia were communicated by the patients or their attendants. Intramural epidemics of these septic diseases became so serious that the tearing down of buildings and their replacement were urged as the only method to get rid of the infectious plagues.

In 1861 the death rate after amputations in all the Paris hospitals was as high as 3 deaths among every 5 operations. Although he was one of the severest critics of the antiseptic method, Sir James Simpson, speaking on the same program with Lister at Belfast in 1867, asked the public health section of the National Association for the Promotion of Social Sciences the following question: "To what extent are hospitals as in general at present constituted banes or blessings, and how can they be so changed as to convert them from the former to the latter?" He suggested that stone and marble palaces should be abandoned and that iron or wooden villages should be built in their place. He thought that in this way the new buildings would be free from the polluted air which he supposed caused the infections and surgical diseases to which all such hospitals were subject at that time.

AMERICAN CLINICAL LECTURES

E. C. SEGUIN M.D.

VOLUME III

TWO LECTURES ON LISTER'S ANTISEPTIC METHOD OF TREATING SURGICAL INJURIES

JAMES L. LITTLE, M.D.

PROF. OF SURGERY IN THE MEDICAL DEPARTMENT OF THE UNIVERSITY OF PENNSYLVANIA
PHILADELPHIA
NEW YORK
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CHICAGO
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NEW YORK
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SAN FRANCISCO

NEW YORK
G. P. PUTNAM & SONS
FIFTH AVENUE
1898

Fig. 5. Dr. Seguin was Dr. Ridlon's preceptor in New York before 1890.

Even as late as 1874 Sir John Erichsen suggested that hospitals should be torn down and rebuilt periodically. He said "Once a hospital has become incurably pyaemia stricken it is as impossible to disinfect it by any known means as it would be to disinfect the crumbling wall of the ant that have taken possession of it, or an old cheese of the maggots that have been generated in it."

It is for these reasons that Lister chose "The Effect of the Antiseptic System upon the Salubrity of Hospitals and Hospital Wards" as the title for one of his early papers.

In 1853 when Lister arrived at the University of Edinburgh to begin his graduate study of surgery with Professor James Syme, Syme was at the height of his professional career. His reputation for surgical skill, as a teacher and for exceptional personal qualities had extended not only through out the British Isles but into Continental Europe and America as well.

In surgery as in other ways, Syme was a militant crusader. He could be and often was a general host to friends in his home but in public and in the principles and methods which rested upon his fine training and his experience, and he was against all tendencies or teachings which he considered to be less worthy of consideration.

Lister had been sent to Edinburgh with a letter from William Sharpey, a great friend of Professor Syme. As a student Sharpey had studied at both Edinburgh and Paris and it was in Paris that he formed a lifelong friendship with Professor Syme.

Lister's first paper at University College, London written under Sharpey's supervision was on the conduct of the iris of the eye and the physiology of vision. It is now interesting to remember that in this paper Lister commented upon the fact that the methods employed had served to delay the decomposition of the tissues upon which he was engaged.

When Lister became house surgeon to John Eric Erichsen in London (1852) he had charge of his first patients. Erichsen had written and continued to write some of the best literature in the entire history and development of surgery. One of his special anxieties was with regard to hospital gangrene, wound infection and blood poisoning after injuries and operations.

It was generally believed by surgeons that putrefaction and gangrene were occasioned by the action

(The) refers to the few former held that maggots and other small animals originated the process in decomposing or putrefying organic matter. Not only Pasteur with his germ theory and his demonstrations as to the continuity of life in bacterial cultures, but Koch with his ideas and other scientific workers, spent years in proving that all living things have living parents.

cess of the oxygen in the atmosphere to the wound. Lister made it his special study to observe and compile data upon surgical complications as they occurred and to note conditions or materials that seemed to affect the course of the various kinds of inflammation and surgical disease.

The circumstances under which Lister saw his first surgical operations thus accounted in considerable measure for his interest in the causes and effects of inflammation. The use of ether and chloroform was just becoming general and patients consented to have operations performed because they could be done without pain and without some at least, of the risks to which they had been accustomed. Surgeons themselves were much more courageous in undertaking operative procedures about

THE
Manner of Curing all
FRACTURES
AND
DISLOCATIONS,
Incident to
Humane **BODIES,**
By the Means of
BANDAGES

Compiled by *M. Lawrence Verduc,*
Sworn Master Surgeon at Paris

LONDON,

Printed for S and J Sprint, J Nicholson,
in Little Britain, and A Bell and
R. Smith in Cornhill 1706.

Fig. 4.

it be in bagging wounds or boggy hands. (42-2 ed pp 285-286)

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"(1) That these germs must be prevented from getting into wounds during and after operations, and that they must be killed if possible outside the wound

(2) That if they have succeeded in getting into a wound before the case is seen by the surgeon as in compound fracture they must be killed if possible before they have had time to spread and secure a footing and further germs must then be prevented from entering the wound afterwards.

"These principles still hold the field whatever methods are employed to carry them out, and they are not likely to be given up till some means have been devised for protecting the body against all germs which may enter it, and this is certainly not within sight at the present time. (25—Pp 50-51) (New chemical techniques have usually contributed complications, false confidence and confusion H W O)

Lister's first operation was the opening of a psoas abscess, and it is interesting to note how he did it. (1) He first prepared a mixture of one part of carbolic acid to three parts of boiled linseed oil. A piece of lint about six inches square was soaked in this solution and placed over the site of operation for some time before it was performed the instruments were also placed in carbolic oil, and naturally the surgeon's and assistants' fingers became coated with it. When everything was ready the piece of lint was raised at one side and an incision was quickly made into the abscess the lint was then allowed to fall back over the wound and the pus was squeezed out of the abscess under cover of the oiled lint, and finally a strip of the oiled lint was pushed through the opening into the abscess in order to keep the wound from closing

(1) I cannot find the exact date of this operation but I think that it was early in 1867

Several of Lister's biographers have pointed out that Lister endeavored from the beginning to employ chemicals for the purpose of excluding germs from wounds, and this is true. The use of carbolic acid to exclude infection was the fundamental conception with which Lister inaugurated his antiseptic system. He was so emphatic on this point that when Von Bergman and his followers began to advocate the aseptic method it was supposed by many that there had to be two schools of surgery one the antiseptic, in which chemicals were used entirely and the other the aseptic, in which nonantiseptic solutions for washing germs away and boiling and heat with sterilized dressings were employed as the technical agents.

One may suppose that this situation was partly responsible for Lister's further studies of germicides and germicidal dressings while some who

LE MAISTRE

EN CHIRURGIE,

O U

L'ABREGE COMPLET

DE LA

CHIRURGIE

DE

GUY DE CHAULIAC,

Par Demandes & par Réponses

En la manière qu'on interroge les Aspirans à
Saint Cosme

Par L. VERDUC Maître Chirurgien Juré à Paris

Non elle Edition augmentée d'un Dictionnaire Etymologique des mots d'usage du Oec qui sont en usage dans la Chirurgie



A PARIS
De l'Imprimerie de la Veuve de HOUAY rue
de la Harpe au Saint Esprit.

N DCC. XL
Avec Approbation & Privilege du Roy

Fig 7

held themselves out to be really opponents of the Lister method made their campaign on the side of the asepticists. It is easy now for us to see that these two schools had much in common but the antisepticists are still responsible as they were in Lister's time for a misunderstanding of the proposition that to protect a patient against infection and especially against mixed infection is one of the greatest services that a surgeon can render in or out of the operating room.

That Lister did become confused by both friends and enemies is indicated by his reaction to the early German demand "Fort mit dem Spray, and by the fact that both British and American visitors saw the tendency away from his original ideal and toward attempts to cure wound infection by new and different changes in technique. The following was from a Philadelphia surgeon

Most of Lister's contemporaries did not recognize the fact that he was contending for a principle in surgery they looked upon his innovations as nothing more than the introduction of some new

A REPORT HOSPITAL GANGRENE,

ERISPELAS AND PYÆMIA

AS OBSERVED IN THE

DEPARTMENTS OF THE GUIN AND THE LINCOLN.

CASE AL L

BY M. GOLDENWITH

Surgeon

PUBLISHED BY PERMANENT OF THE SURGEON GENERAL U. S. A.

LOUISVILLE

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1893

Fig 6

the dangers of which otherwise the patients knew very little.

Lister saw these operations at University College Hospital in London. While many of them were performed with considerable dexterity on the part of the surgeons, there were still the surgical complications which always prevailed in every hospital after injury or operation.

It does seem strange that Lister alone of those who witnessed the after effects of operations and the surgical diseases of that period should have arrived at an understanding of these surgical complications. As it was, he had studied the problem sufficiently so that the discovery of germs gave him, first, the cue to the use of antiseptics for the prevention of the 'hospital diseases.'

As Sir Clifford Allbutt said, 'Lister was sitting on the heights and watching there alone for Pasteur's discovery

From the point of view of the exclusion of the causes of putrefaction Lister's exposition even

as reported by Godlee should, if it had been understood by surgeons generally have saved much of the confusion and many of the erroneous practices (including the Carrel-Dakin method) of the last 70 years. Godlee said 'With carbolic acid as the antiseptic he (Lister) introduced what he called a 'protective. This was a material (mactintosh) unstimulating in itself and impervious to carbolic acid. The intention was to place a piece of the protective, of limited size, in immediate contact with the wound, in order to protect it from the imtation of the dressing which, however overlapped the protective widely on every side.

Lister was using the protective in 1869 but he first described it in 1870 in a clinical lecture at Edinburgh in which he thus explained its meaning and purpose 'Of all those who use antiseptics in surgery I expect that I apply them least to the surface of the wound. After the first dressing, the object which I always aim at is to have the material in contact with the exposed tissues approximate as closely as possible to the perfectly bland and neutral character of the healthy living textures. If you consider the circumstances of a simple fracture, which you cannot too often call to mind if you wish to keep your ideas clear and right upon this subject—if you remember how the severe contused internal wound, with the interstices of the mangled tissues loaded with extravasated blood, recovers quickly and surely under the protection of the unbroken integument, it is plain that all that is required in an external wound is to guard it against the disturbing influence of (any) external agency. The injured tissues do not need to be 'stimulated or treated with any mysterious specific' all that they need is to be left alone.

"Our 'protective, then should be a material unstimulating in its own substance, and impervious to carbolic acid. At the same time it must be insoluble in the discharges, and sufficiently supple to apply itself readily to the part.

"These principles' will be found to apply whatever be the materials used for carrying out the antiseptic system. An antiseptic to exclude putrefaction with a protective to exclude the antiseptic will, by their joint action keep the wound from abnormal stimulus" (51—2 ed. pp. 216-217)

Perhaps further clarification of Lister's original ideal is unnecessary but here is a statement from the long time associate who was the 'Boswell of his entire professional career' (25—Pp. 10-11) 'Lister's application of Pasteur's statements

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Protection of the tissues and exclusion of infection—see details of technique. (H W O)

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Surgeon V. S.

PUBLISHED BY PERMISSION OF THE SURGEON GENERAL U. S. A.

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44 W. 3. GILBERT ST. AN OF THILL
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Protection of the tissues and exclusion of infection—the details of technique (1170)

gist and pathologist of his day but for a laboratory man he had an extraordinary appreciation of the clinical side of his work. The combination of these two in European study was an incident of the greatest importance especially as they spent some time on Lister and his work. When they returned to America they brought back cultures from the Lister laboratory which as Dennis said satisfied him for the first time that there was a germ cause of disease and wound infection. Dennis persuaded Mr. Andrew Carnegie to build and equip a laboratory not only for this study but for instruction at Bellevue and this was the first of its kind in this country.

Upon the occasion of the visit of Dennis and Welch to Guy's Hospital in London they found the great change that had already taken place in the percentage of deaths after compound fractures and wound infection. The reduction in some classes of operations and infected injuries was from 65 per cent down to an actual zero. Dennis confessed that for his own part he remained skeptical of the germ theory of inflammation until the Carnegie laboratory gave him the opportunity to work out the problem for himself. He concluded his report, as follows:

"The reduction of the death rate from 68 per cent, which half a century ago was considered a brilliant achievement, and a result which was thought worthy of publication to that of a cipher represents what surgery has done for the amelioration of human suffering and the preservation of life. Humanity indeed, owes a debt of gratitude to the science of surgery which has annihilated pain and suffering and has preserved and prolonged human life. For this great work—to the former (Pasteur) as the discoverer of the means, and to the latter (Lister) as the one who applied the discovery to surgery the profession are indebted. Surely their names must ever be associated with the march and progress of the grandest profession in the world. (33—Vol. 1 pp. 422-423)

The drift away from the Lister ideal was indicated by many incidents such as the following:

In 1886 after stating clearly the conception of exclusion "Watson Cheyne diverts at once to some of the antiseptic techniques that were and have continued to be violations of the original Lister idea.

He said, In the Listerian Method the object is to prevent the entrance of living organisms into the wound."

(If there were putrefactive or septic complications in the wound, the above [as so often since]

Health, Dictionary of Practical Surgery, I and II in one volume. Philadelphia: J. B. Lippincott Co., 1886.

1 to 20 solution is also used for the instruments and sponges during the operation.

I dwell on this point, as there is some difference of opinion as to the use of these 1 to 20 solutions. In order to settle this, I wrote Mr. Lister and received the following reply:

15 PARK CREMANT, PORTLAND PLACE, 11th Dec., 1877

MY DEAR SIR—In reply to your inquiry in your letter of Nov. 26th, received yesterday, I write to say that I use the 1 to 20 carbolic acid lotion for purifying the skin of a part about to be operated on, and also my own hands before I begin to operate, and for cleansing instruments and sponges, and also for the spray when a steam spray producer is employed. The 1 to 4 lotion is our ordinary lotion used for the sponges during the course of an operation, (the sponges having been purified before the commencement of the operation with 1 to 20) and for washing the wound when requisite, and for the lotion in changing dressings. The 1 to 20, I should add, is used for washing (in order to purify them) wounds inflicted accidentally such as compound fractures.

Thanking you for your kind report of the progress which antiseptic surgery is making in America,

I remain, yours very truly
JOSEPH LISTER

A very important feature of this method, is the use of the spray. This is used for the purpose of destroying the septic germs in the air before they reach the wound. So we have to perform our operations and apply our dressings in a cloud of spray formed from a 1 to 20 solution of the acid. The apparatus we generally use is a steam atomizer.

A good spray producer should break up the fluid into a fine cloud, the finer the better as coarse spray soon settles upon the clothing and condenses rapidly upon the bed, and the hands and clothes of the surgeon. The apparatus should be large enough to work for from one and a half to two hours at once. It should be so arranged that it can be placed and maintained at any level that may be desired, and should

Fig. 8.

seems to have been forgotten in Sir Watson's further instructions)

"Disturbance is easily remedied by proper application of a drainage tube. Inflammation of the edges of the wound subsides as soon as the stitches are cut or removed (and more organisms introduced by the dresser' or even by the surgeon himself)

Mr. Cheyne (Sir Watson, later) continued, "The irritation of the antiseptic employed may also interfere with healing. In spite of Lister a earlier emphatic injunctions carbolic acid, carbolized gauze, salicylic acid (powder or ointment) acetate of aluminum, eucalyptus oil, and chloride of mercury (and how many since that time) are all suggested for application directly to the wound surface!

form of wound dressing. The simple dressing employed by my father (John Ashhurst, 2—Pp 16-17 and 22-23) than whom no one secured better wound healing in these preantiseptic days, consisted in lint saturated and kept moist with pure lan-danum, the use of which he had learned from that excellent surgeon Dr Joseph Pancoast after forty-eight hours diluted alcohol was substituted and continued until the wound was nearly healed.

Their objections to Lister's methods were, above all that they were always being changed: first it was carbolic acid then carbolized oil then the carbolic putty then watery solutions then a carbolized cerate plaster then a 'lac plaster' then oil of eucalyptus. Was there to be no end of innovations?

This uncertainty about technical methods in surgical practice has been disturbing ever since. Anxiety about the chemical to be used, the spray material for sutures, dressings and drainage tubes caused surgeons to forget all about "exclusion" of infection, the protection of the wound surface, and the patient.

As one of his house surgeons said, In those days Lister was so sadly misunderstood that the idea became prevalent that he considered carbolic acid possessed a mystical charm over wounds. Only bring carbolic acid upon the scene, and pyæmia and septicæmia would vanish! One day he read to us a letter he had received from a surgeon expressing his disappointment that although carbolic lotion had been sprinkled upon the wound, and basins of it had been placed around the bed, and some had even been sprinkled upon the floor yet the patient died!

Among the controversies that raged about the introduction of the Lister antiseptic method none was more serious or prolonged than that with reference to the use of the carbolic acid spray. Lister himself believed at first implicitly in the importance of this attempt to sterilize the atmosphere. He thought that carbolic acid in the air was just as important as the cleansing of the surgeon's hands or the carbolizing of the dressings by which he hoped to exclude all infection from the wound area.

It is easy as we look back to understand Lister's point of view. Pasteur had performed various experiments with culture fluids in open and closed flasks and flasks with cotton and other kinds of filters to keep out germs. All of these experiments indicated many living organisms constantly present in the atmosphere. Lister felt that any wound surface exposed to an atmosphere so alive with living matter must therefore always be exposed to

the dangers of the putrefaction, fermentation, and infection about which he had been so much concerned.

It was only after a number of years and after becoming convinced of the greater importance in surgery of clean hands and dressings and sterilized instruments that he decided to abandon the spray. The pressure of many colleagues had a good deal to do with this change of mind, but Lister said he was ashamed to have advocated a method which was injurious to the patient, injurious to the operators, and both inefficient and unimportant in protecting the patient against infection.

Since Lister's time it has been shown again that the factors of greatest importance in causing infections in operative wounds or in wounds that are being dressed are the fingers and hands, the dressings and instruments which the surgeon handles, the surgeon's nose and throat, or the poorly prepared skin of the patient himself. These are the sources of most of the primary as well as most of the postoperative mixed infections in these cases.

Even so there occasionally still appear articles about the sterilization of the air by means of chemicals or light or electricity all very spectacular and dramatic but relatively unimportant in the conduct of surgical operations and operating amphitheatres.

A common criticism of Lister's method in the early years and one of the reasons for delay in its acceptance was that Lister declined to collect and tabulate statistical evidence in support of his teachings. As an actual fact, this would not have been difficult to do. Lister himself however was impatient with the statistical method. He realized, as many other surgeons have had to do, that clinical statistics may be accumulated and printed to prove almost anything. Elaborate reports, including statistics with regard to patients, have been manufactured to support theories or points of view without too much care as to their accuracy or even their truth.

As time went by however and after Lister came to Kings' College in London in 1877 some of his own assistants, as well as workers in certain other hospitals, collected and published sufficient material to more than justify the claims that had been made for the antiseptic method.

In 1876, William H. Welch and Frederick S. Dennis finished their services in Bellevue Hospital and went to Great Britain and Europe, for post graduate study. Dennis later became a foremost New York and American surgeon with the somewhat unusual advantage of having always been a first class laboratory man besides. Welch, as everyone knows, was the leading laboratory bacteriolo-

geons the Lister Antiseptic Method for \$100 00 I have heard that when President Grant suffered from the effects of cancer of the throat, Morris wrote to the attending surgeons of New York Philadelphia, and Washington and offered to treat the President by the Lister method if they did not care to do so For these and perhaps other reasons Morris was not too popular in New York Ridlan told the story that at an annual dinner of the American Orthopedic Association at the Knickerbocker Club he sat by William T Bull of New York with Bradford of Boston on the other side Bull said that a few days before Morris had approached him and asked whether it would do his reputation any harm to have a business association with A. M. Phelps one of our early and aggressive orthopedic surgeons of New York Bull said No A day or two later Phelps met Bull and asked whether it would affect his professional standing adversely to be associated with Morris Bull again said No

Morris published several very sound works on the antiseptic method but they inclined too strongly toward a chemical and too frequent dressing sort of listerism His attitude in general is indicated by the following

Mr Lister believed his wounds to be aseptic and the belief has caused greater dispute than its importance warrants for whether or not microbes are present in a wound it is a matter of no importance provided that their growth be so hindered that natural reparative processes are not interfered with (101 p 7)

Morris militant championship of the Lister method reflected more or less the leadership that New York assumed in the use of the antiseptic system in America Partly for that reason perhaps there was some resentment in other parts of this country against the early claims made for the better surgery being done in the New York metropolis.

Although Philadelphia, as upon other occasions, voiced its criticism of the assumptions of New York surgeons, it was demonstrated that there was a basis for the New York claims not only by the final triumph of the antiseptic reform in surgery but by the results being obtained at the time.

C B Penrose in the *Medical News* of October 16 1886 reported upon Antiseptic Surgery in the Pennsylvania Hospital. Commenting upon Penrose article, an editorial writer of the period spoke as follows

New York surgeons have long been accustomed to hear their visitors from Philadelphia after watching the painful and elaborate precautions taken to avoid or overcome infection of a wound declare that they obtained just as good results without such appliances, and that pyemia and

septicaemia were almost unknown in their hospitals.

With the application of strict antiseptics to a limited number of cases, very much better results were at once obtained while the remaining cases treated in the old way (some antiseptic appliances, but no antiseptics) ran the same course as before A list of seventeen major operations conducted aseptically during three months, shows very satisfactory results If a similar condition of affairs exists in any other Philadelphia hospital it is to be hoped that a similar experiment will be promptly tried

There are many passages in the Lister biography by Sir Rickman Godlee that indicate confusion in his mind also as to the true relationship of the original listerian idea to modern antiseptic surgery This is nowhere more in evidence than in his discussion in 1918 of the recently proposed Carrel Dakin method Sir Rickman Godlee said Carrel's treatment would have delighted Lister It is an extension of his own system to infected wounds such as be only attempted or succeeded in carrying out in a limited number of cases, particularly those of operations through parts that were the seat of chronic suppuration

One might feel that Sir Rickman Godlee supposed (in 1918) the Carrel Dakin method to be a real refinement or improvement upon the carbolic washes used by Lister in some of his operations. However it seems quite certain that Lister would have objected to repeated applications of any chemical many times a day to any wound surface. It was always Lister's teaching that chemicals caused irritation and discharge, and delayed healing Also Lister most certainly would have opposed frequent exposure of the wound surface to other kinds of injury by rubber tubes, instruments, gauze dressings, and new infection

Godlee's misapprehension as to the fundamentals of the Lister method show themselves elsewhere in his comments upon the Carrel Dakin method He said

Carrel claims to have solved the problem of the disinfection of wounds, whether the infection be acute or chronic by means of a chemical antiseptic and he calls this treatment "une methode chimiotherapeutique"

It is not strange that Sir Rickman Godlee and others were deceived In the most dogmatic way Carrel laid stress on the following points

The choice of a suitable antiseptic. In the search for such a substance he was helped by Dr

*Carrel, A. and Debelly, G. Le traitement des plaies infectees Paris. Masson et Cie, 97 English translation by Child. London. Bailliere Tindall and Cox, 97

Just as an afterthought—which seems to have deterred no one—he said, Some of these antiseptics are objectionable on account of their poisonous and irritating properties. In the same volume¹ (Vol II p 426) Victor Horsley said regarding the treatment of septicaemia: A vigorous attempt to attack the poison in the system should be made by administering large doses of quinine and salicylate of soda. Ice bags, sponging and “special treatment” (not specified) were recommended for other complications. And that is about where we are now except that we have gone through the sulfa drugs and penicillin to streptomycin. We are beginning to be rational rather than empirical to the extent of better exclusion of infection both during operation and in the postoperative care. We are limiting the inflammatory processes and infectious organisms to wound areas by slowing down the lymph flow with better immobilization and actual rest. And we are now trying to use chemical cures that may not help the patient more but at least hurt him less.

Hey Groves² described in a few words the impasse at which most surgeons had arrived at the turn of the century as follows: “The antiseptic system aims at the destruction of bacteria (by) the action of chemical bactericides. The aseptic system aims at the prevention of wound infection (by) the exclusion of bacteria from the wound (by) heat for the destruction of the germs and using no chemicals in contact with the tissues.”

Hey Groves calls it the modern system to depend upon “vital resistance, exclusion of bacteria, and destruction of bacteria by artificial agencies.”

It seems strange to have this original listerian idea so clearly expressed without going back (in 1911 or now) to 1865 and Lister himself. For that is exactly what Lister proposed with (1) his primary cleansing of skin, instruments, and surgeon's hands with carbolic acid (2) his beeswax carbolic dressing (not in contact with the wound surface) and (3) his care to prevent the access of infection to the wound either by penetration through or around wet dressings.

It should be recalled that Lister had neither the conception of specific pus, gas, or other infections, nor the major role of soiled dressings, instruments, and fingers that we have now.

He was preoccupied with the role of the air as a carrying medium for the causes of wound putrefaction. However his technique was more nearly correct, because of his desire to keep out all germs, than many of our procedures have been since as

¹Health Dictionary of Practical Surgery I and II in one volume. Philadelphia. J. B. Lippincott Co. 1886.
²A Synopsis of Surgery. 5 ed. p 77 New York: Wm Wood & Company. 9

we rely upon mercurochrome, the sulfonamides, or penicillin to compensate made the wound or the patient for sins of commission and omission before, during and after the wound comes under the care of the surgeon.

The drift away from the clinical exclusion of the causes of putrefaction to the laboratory search for a chemical cure for infection, which began with Lister himself and reached its climax in the Carrel-Dakin method had the effect of leading most surgeons entirely away from rest for the wound and the patient, protection of the limb in correct position for compound fractures, and from Lister's own original idea. The wound has been exposed too much and too often in postlisterian practice to permit of an adequate regard for these important surgical principles. The confusing effect of research on fermentation and the effects of chemical antiseptics upon Lister himself however was never as serious as for his followers. Lister after all, kept his original principle of wound protection in mind. Many others who have supposed themselves to be employing the Lister method have not known what the original Lister idea really was.

Even Lister's own pupils and assistants were early led astray as witness the following:

“As regards local treatment under such conditions, it is probably best to go on with the stuffing of the wound with gauze saturated with iodoform or where the wound is extensive or contains sloughs, or where there is a diffuse cellulitis in its neighborhood, it may be advisable to employ constant irrigation with the view of washing away the septic material as soon as it is formed. (31—p. 67).

That Sir Joseph Lister himself was tending in the same direction is shown by his attempt to treat the wound instead of adhering to his original plan of excluding infection. He said:

“The double cyanide might, I believe be very satisfactorily used in military practice as a first dressing by dusting it over the wound with a pepper box, and covering with any absorbent material that might be at hand. The salt might be used with the utmost freedom as experience has shown that there is no risk of its producing poisonous effects. Some surgeons who undertook the use of the cyanide in this way in the late South Africa war had unfortunately no opportunity of doing so at the front. But Mr. Sheatle informed me that granulating wounds behaved more satisfactorily with the cyanide than with iodoform, while the unpleasant odor of the latter was, of course, avoided. (31—p. 48-49)

Robert T. Morris of New York was one of the early enthusiastic antisepticians in America. Reddon told me that Morris advertised to teach sur-

From May 1915 it became evident that wounds treated after a certain method by the aid of hypochlorite or the chloramines of Dakin, were sterilized without any harm resulting to the tissues or the patient. From that date it has been possible to prevent in the greater number of cases infection of wounds, and to abolish almost entirely suppuration in hospitals." (p. 8)

And he commented somewhat sarcastically: Although Sir Almroth Wright's doctrine was founded not on observations and experiments made upon wounds under actual war conditions, but upon ingenious theories and experiments *in vitro* it was accepted by the majority of surgeons. One of them even affirms that asepsis ought to take the place of antiseptics (Hear! Hear! H W O) and that antiseptics not only fail to sterilize the wounds, but that they actually favor the development of microbes." (p. 5)

If one may say wound infection and wound complications instead of microbes Dr Carrel will not only have failed to make the criticism which he intended but will have stated an important truth. A truth moreover which at the very beginning invalidates the premise upon which he undertook to establish the Carrel Dakin method. It is in the ability of the surgeon to anticipate and to assist, or co-operate with the natural forces of the patient in his recovery that he may often be useful at all.

It should be remembered that many of the accidents that occur to surgical patients occur in the course of the efforts on the part of the tissues, or on the part of the patient himself to get well. For example an artery with an ulcerated wall, which may be the source of even fatal hemorrhage, or a large segment of one of the long bones which undergoes necrosis and becomes a sequestrum is an incident in the efforts of the patient to evacuate pus from a cavity which has not been drained early or adequately by his attending surgeon. If this abscess cavity is drained sufficiently early the sloughing of the tissues to provide an avenue for the escape of pus or the involvement of the artery in the ulcerative process may be avoided and the patient may evacuate his suppurating cavity safely. But for his protection the incision must have been made in the right place and at the right time by his surgical attendant. Moreover in the post-operative care the use of mechanical or chemical barriers to prevent the addition of other organisms and the development of symbiosis is equally the opportunity and responsibility of the surgeon who is standing by. Against many accidents to the

wound the patient is as helpless without special help as he is against internal changes that occur within his own structures unless he receives intelligent and prompt assistance from those who have been trained to understand his symptoms to interpret the steps and the progress either of his disease or his recovery and to apply those measures with which the surgeon should have become familiar as a result of our thousands of years of experience.

The surgeon can serve best by protecting the wound surface, the inflamed part and the patient against trauma chemical irritation and infection and by limiting any or all these factors to the original area of injury or operation.

For this we have improved but little upon the rules laid down by Lister and Hugh Owen Thomas. Exclusion of infection and the kind of immobilization that slows down lymphatic flow and limits organisms and toxins to the injured parts is all that the patient usually requires. With reduced amounts of infection and systemic toxemia, he can usually muster the requisite resistance and physiologic defence just as in a simple fracture. At any rate it is to be considered that until we do have specific cures for pus organisms or specific body defenses for wound infections, we should attack less and defend more in the interest of recovery by rest enforced uninterrupted and prolonged.

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Henry D Dakin who after testing a great many fixed upon a solution of hypochlorite of sodium polyborate of sodium, and small quantities of free hypochlorous and boric acids. (Unfortunately Lister himself had led the way in this kind of clinical research.)

The gentle but thorough mechanical preparation of the wound—that is, the opening up of all diverticula, the removal of foreign bodies, blood clots and damaged tissue, and the complete arrest of bleeding.

The introduction of the antiseptic fluid, either by constant irrigation, or at intervals of not more than two hours, through fine India rubber tubes permanently fixed in all the recesses of the wound (Lister said repeatedly not to apply chemicals to the wound surface.)

The daily bacteriological examination of the discharges and the closure of the wound when the number of micro-organisms has been reduced below a number which experience has shown will not interfere with the occurrence of primary union (To undertake the sewing up of any wound containing pockets of organisms is to invite abscesses and systemic infection. There can be no clinical or laboratory test that will tell us when such a sewing up or wound closure is safe. It is a gamble with the patient's limb or life at stake in every case.)

I do not agree with the following statements of Sir Rickman Godlee

Carrel's treatment would have delighted Lister and It is an extension of his own system to infected wounds, such as he only attempted or only succeeded in carrying out, in a limited number of cases, principally those of operations through parts that were the seat of chronic suppuration."

In the War Manual for orthopedic surgery prepared by Brackett and his associates in 1918 (Lee and Febiger) they wisely evaded the confusion regarding antiseptic wound therapy prevalent at that time. No recommendations regarding the treatment of wounds or joint injuries were made at all. Instead the fundamental importance of correct position for injured parts and the orthopedic point of view during both primary treatment and after care was wisely emphasized throughout.

In our orthopedic manual for World War II (Saunders, 1942) the same discretion was not observed. Numerous laboratory and clinical technicians were permitted to exploit their views and certain miracle drugs, to the great detriment not only of immobilization in correct position but even of the exclusion of infection for which Lister had provided us with better standards in 1867. That many were affected unfavorably by the highly toxic sulfa drugs is now also a matter of record.

We continue to disregard the injunctions of Lister and even of many of his contemporaries like Simpson, Tait, Cheyne, and our own Robert T Morris (103). Some of these men were friends and some violent critics of the antiseptic system, but they all recognized the patient and his own defenses as the major ally (not the antiseptics) of the surgeon in surgical care.

Morris said "The patient himself is to be our best ally and in our pride of achievement with artifices against the bacterium, we are not much longer to disregard such an ally as nature gives us in the patient." (103—p. 40.)

"For the last thirty or forty years we have tried so conscientiously and so scientifically to help the patient by following up his bacteria that we no longer past the patient himself altogether" (103—p. 55).

After more than forty years, during which thousands of chemicals and chemical antiseptic methods were tried and after the apparent breakdown of the antiseptic method in the World War I, we arrived at 1916 and the Carrel-Dakin method. The pretended simplicity of curing wound infections by the Carrel Dakin program is indicated by three short quotations with an apparent disregard for everything that had been written upon the subject previously. Dr Carrel said

"On the other hand the problem would appear to be readily solved by using a substance unreacting to the tissues, and of a sufficient bactericidal power to kill all the microbes present in a wound, be their nature what they may.

"When at the end of December 1914, Henry D Dakin and one of the authors of this book (Carrel) sought to discover the best means of treating wound infections, they adopted, for the reasons just stated the method of chemo-therapy.

"The method was applied in the first place to old wounds, afterwards to recent ones. Sterilization was attained in both cases, but the earlier treatment gave more rapid results. It has long been admitted that preventative treatment of a malady costs less in money and toil than a curative treatment. However infection can be checked even after suppuration has become established. In a word, all infected wounds were brought more or less under control by chemo-therapy.

That this program differed in principle in no respect whatever from thousands of similar attempts made between the times of Lister and Carrel does not seem to have occurred to Carrel at all and he claimed 100 per cent control of infected wounds with the same confidence that many others have before and since. Carrel continued

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ABSTRACTS OF CURRENT LITERATURE

SURGERY OF THE HEAD AND NECK

HEAD

Bailey H: Parotidectomy: Indications and Results *Brit M J* 1947; 1: 404.

Emphasis is made on the fact that the parotid gland is a bilobed structure consisting of a large superficial, and a small deep lobe connected by an isthmus. The author compares the facial nerve to the meat within the parotid sandwich. It is his avowed purpose to dispel deep rooted misconceptions concerning parotid tumors. These misconceptions are related to the relationship of the facial nerve and the boggy of facial palsy. This has resulted in ill advised recommendations to leave the tumor alone or to wait until it gets larger, it apparently not being realized that as a consequence the seventh nerve will be eventually involved by the tumor anyway and this can be prevented only by surgery. By this time the tumor has become widespread and it is well to remember that the superficial appearance of the tumor now represents its true size. The tumor is likened to a veritable iceberg. It usually arises in a comparatively circumscribed area a little in front of and above the angle of the jaw. The only other common starting point is in the region immediately in front of the tragus. Here the differential diagnosis between an enlarged preauricular lymphatic gland and a mixed parotid tumor is impossible at first, but if the lesion does not subside it is well to consider it a parotid tumor.

True cysts of the parotid are exceedingly rare. The author has seen only 1 case among 100 cases of noninflammatory swellings of the parotid gland. Adenolymphomas, which are cystic tumors probably arising from the lymphoid conglomerate that surrounds the first branchial cleft are definitely benign. Such tumors are exceedingly rare and it is quite impossible to distinguish them from degenerating mixed parotid tumors. Since the operative procedure is less radical for this condition one should take care not to diagnose the condition unless it is bilateral, since an inadequate operation would be done for the neoplastic parotid condition as a consequence.

The author stresses the fact that nearly all parotid tumors are completely radioresistant but despite this fact such therapy is all too frequently recommended to avoid a facial nerve palsy.

He is a strong advocate of subtotal or total parotidectomy rather than enucleation for all cases of mixed parotid tumors. The latter procedure is dangerous because frequently the smaller lesions are merely satellites of the larger lesion. This accounts for the apparently large number of recurrences (30%) in operations performed for small lesions. The author believes that malignant cells spilled during

intracapsular enucleation, or cells left in the interior of a portion of the capsule that has not been entirely removed account for 90 per cent of the recurrences.

It is advocated that a J shaped incision be made beginning at the level of the zygomatic arch, proceeding down the side of the face as close as possible to the pinna and curving around the root of the lobule of the ear to end on the tip of the mastoid process. A large flap of skin is reflected by under cutting. If the whole parotid gland is not in view the incision must be enlarged still farther by extending it down the neck from the tip of the mastoid process, along the anterior border of the sternocleidomastoid muscle. No attempt should be made to remove any parotid tumor until the whole gland is in full view. Only then or even after an extracapsular resection has been begun is it possible to tell how deeply the tumor plunges into the gland. The external carotid artery should be ligated to minimize bleeding. The temporofacial division of the seventh nerve is seen clearly once the superficial lobe has been mobilized. In extracapsular resection sufficient parotid tissue should be removed to ensure that the tumor capsule is not encroached upon. If the tumor is found to extend deeply rather than risk cutting the branches of the facial nerve this operation should be abandoned in favor of superficial lobectomy. The author has done 33 such operations and has noted a salivary fistula in only 1 and this healed within a year.

After operations upon the parotid gland that involve dissection of the seventh nerve and the free use of 60 per cent alcohol in the wound a major degree of facial palsy always occurs and may persist for weeks or months. Early it is well to support the facial musculature by strips of adhesive plaster and, later in cases in which drooping of the mouth persists Dahlberg's internal splint which is a dental prosthesis is best. In 4 cases in which the author had known that he had cut the primary division of the facial nerve, the patients eventually either completely recovered or recovered to such a degree that they are unaware that the nerve is not functioning fully. He believes that the anastomotic twigs connecting the temporofacial and cervicofacial divisions of the seventh nerve, anterior to the parotid isthmus, account for the eventual restitution of function of the seventh nerve when one of its primary divisions is known to have been severed.

In 2 cases the main trunk of the facial nerve was cut and in these instances a strip of fascia was inserted subcutaneously with good effect.

The author fears most the auriculotemporal (Frey's) syndrome following nerve injury in which the patient's cheek becomes red, hot, and painful and beads of perspiration appear upon it when he is

eating. There is also hyperesthesia of the face, especially during shaving.

LEROY J. KLEINSMITH, M.D.

EYE

Bellows, J. G.: Ocular War Injuries. *Am J Ophth* 1947 30 309.

Bellows reports his findings in 300 consecutive cases of ocular war injuries. Although the eyeball measures only 1/375 of the body surface it is frequently injured because of its vulnerability to small particles which might go unnoticed if imbedded in the skin. In each succeeding war there has been an increase in the number of ocular injuries in relation to the injuries to all other parts of the body. Estimates of the eye injuries in World War II vary from approximately 1 per cent of all injuries to from 15 to 17 per cent according to the type of warfare. This series of 300 consecutive patients presented 3 blast injuries, 40 indirect injuries, 299 direct injuries, among which there were 54 nonpenetrating injuries, 206 penetrating injuries and 30 direct injuries to the eye lids, extraocular muscles and orbit and 9 cases of burns of the eyeball and eyelids. 152 cases the injuries were bilateral.

Blast injuries may result from the explosion of shells, grenades or mines. Dust and debris may be driven into the eye by the blast during sudden compression and expansion of the atmosphere. Blast injuries may produce chemosis, hemorrhage causing proptosis and optic atrophy, intraocular hemorrhage following iridodialysis or rupture of a retinal vessel, hemorrhage due to rupture of the choroid and from the retina, and acute iridocyclitis with secondary glaucoma.

Thermal injuries were received by 5 soldiers; they were burns due to fire and burning gasoline. The eyelids were burned and corneal opacities were present.

Indirect injuries result from concussion waves produced by rapidly moving missiles in the vicinity of the eyeball. These injuries more often involve the posterior segment than the anterior because the macular area is the most fragile and vulnerable region. The symptoms and findings vary with the nature of the lesion and may appear immediately or several days or months later. They comprise traumatic hemorrhagic retinitis (hemorrhages, exudates, edema, destruction of arteries and dilatation of veins), paralysis of the orbicularis palpebrarum, exophthalmos, and changes in the vitreous, choroid, retina, and optic nerve.

Direct or contact injuries are produced by the impact of a missile upon the eyeball. Contusion, perforation, penetration, laceration and avulsion may occur.

Nonpenetrating or contusion injuries may reveal corneal abrasions, imbedded foreign bodies in the cornea, conjunctiva, or sclera, or rupture of the eyeball. According to Markelova, 58 per cent of ocular military injuries are nonpenetrating. The following

symptoms and signs may be found: hyphema deep in the anterior chamber, tears of the iris, iridodialysis, rupture of the margin of the pupil, iridodonesis, mydriasis or deformity, dislocation of the lens, cataract and hypotony.

Penetrating injuries generally involve the cornea more than the sclera. One hundred and four cases among 306 in this series required enucleation, 64 eyes retained foreign bodies.

Rupture of the eyeball in 105 cases required primary enucleation or early secondary enucleation.

Intraocular foreign bodies were most frequently found to have entered the eye through the cornea. In war, bilateral involvement is frequent and the particles are smaller, multiple and nonmagnetic or weakly magnetic in contrast to foreign bodies in civilian life. A foreign body within 3 mm. from the center of the cornea is considered anterior to the lens, between 3 and 7 mm. within the lens and between 7 and 24 mm. within the vitreous humor. Copper may produce a purulent reaction or chalcosis bulbi. Aluminum, rock, glass and lead are all tolerated.

The following pathologic lesions were observed in 65 cases: cataract, 30 cases; iris and pupillary lesions, 30; corneal opacities, 18; intraocular hemorrhages, 7; phthisis bulbi, 13; choroiditis, 11; adherent leukoma, 9; retinal detachment, 8; vitreous opacities, 7; endophthalmitis, 4; rupture of the choroid, 3; alderosis bulbi, 3; chalcosis bulbi, 2; hole at the macula, 1 case; avulsion of optic nerve, and sympathetic ophthalmia, 1.

Accurate localization is an important factor in the proper management of intraocular foreign bodies. The Berman metal locator is of value in localizing intraocular foreign bodies, but a negative reaction does not preclude the presence of a magnetic foreign body. The posterior surgical approach was employed in nearly all cases. Among 65 cases of intraocular foreign bodies, 29 magnetic particles were removed in 4 of these cases 2 or more other particles still remained within the eyeball which indicated that magnetic and nonmagnetic foreign bodies are often combined. In 36 eyes the foreign body was considered nonmagnetic.

The results are summarized as follows: in 20 cases enucleation was done, 4 eyes were preserved but blindness resulted; in 22 cases the visual acuity was less than 20/200; in 23, the visual acuity was between 20/200 and 20/40; and in 6 the acuity was 20/30 or better.

JOSEPH ZUCKERMAN, M.D.

BEY, H.: Some Observations on the Symptomatology and Diagnosis of Cases of Proptosis. *Br J Ophth*, 1947 3 55.

The author reviewed his cases of proptosis and classified their origin into three groups. The extra-orbital causes of proptosis were due mainly to the frontal and ethmoidal paranasal sinuses and are usually of an inflammatory nature. Nasal trauma, mucocoeles, pyoceles, and neoplasms were not uncommon causes. Nasopharyngeal tumors, both simple and malignant, occasionally caused propto-

sis. In the intraorbital category the proptosis was found to be due to inflammatory conditions, cysts or new growths. The condition in 23 of the 31 cases in this group was caused by new growths. Proptosis due to disease of the bony wall of the orbit was the least common and was caused by an extensive arteriovenous anastomosis, a capillary angioma and in inflammatory conditions of the orbital wall.

Middle and posterior ethmoiditis may spread into the orbital cavity and produce proptosis but may not present any clinical evidence intranasally. In some of the author's cases x-ray examination in the classical positions proved negative, but repeated x-ray examinations showed the cause to be an ethmoiditis. A comparative x-ray study of both orbits may show an x-ray shadow of a tumor mass or a dilation of one orbit. Shadows produced by soft tissue masses were of two types: the dense and the light. Dense shadows were always diagnostic of an underlying cause of proptosis. Light shadows showed as veiling particularly over the orbital periphery and were always found to correspond to a congestion of edematous orbital tissues and therefore demonstrated only secondary manifestations of the cause of the proptosis. An orbital dilation not due to communication with a sinus has been found to be coincident with the presence of an intra-orbital lesion. This sign was positive in 16 out of 21 cases. The author suggests a therapeutic test in cases of proptosis that could be caused by sinusitis or a gumma. Exploration and biopsy should be resorted to in obscure conditions and biopsy should be done in any case having an appearance of malignancy on exploration, before further surgery is done. Punctures of cysts increase the difficulty of removing the tumor and the possibility of spreading malignant tumors.

ROGER H. JOHNSON M.D.

Zoudek, B. Landau, J., and Bromberg, I. M. Allergy to Endogenous Hormones as a Cause of Keratitis Rosacea. *Brit J Ophth* 1947 31 145.

The authors found that a certain percentage of patients suffering from typical allergic symptoms had a hypersensitivity to their own hormones and it was suggested that this could occur in either men or women independent of their genital function. In general allergic eye conditions are ascribed to hypersensitivity of the ocular tissues to exogenous proteins. However it is also thought that the human eye tissue can be allergic to endogenous products of metabolism, as in sympathetic ophthalmia and phakodanaphylactia where endogenous novel pigment and lens proteins are the exciting agents.

The authors attempt to determine whether or not keratitis rosacea can be caused by the presence in the ocular tissue of an allergy to endogenous hormones. In 6 cases of keratitis rosacea (3 men and 3 women) they tested for the presence of allergy to the various hormones by intracutaneous tests. In all 6 cases they found a hypersensitivity to testosterone alone, and they explained this in women by mentioning that the adrenal tissue also produced testosterone.

All 6 cases had been refractory to accepted methods of treatment and had shown gradual progression of symptoms. In 5 cases the condition was treated by daily subcutaneous injections of small and gradually increasing doses of testosterone and in 3 cases by implantations of testosterone pellets. All patients had a cessation of eye symptoms and an improvement in objective eye findings as well as of the facial rosacea. Keratitis rosacea has frequent spontaneous remissions. Although some recurrences have been experienced in the authors' cases the therapeutic results have been such as to lead them to the conclusion that this treatment is specific.

ROGER H. JOHNSON M.D.

Bárány, E. H. The Influence of Intraocular Pressure on the Rate of Drainage of Aqueous Humor. Stabilization of Intraocular Pressure or of Aqueous Flow. *Brit J Ophth* 1947 31 160.

Duke Elder has proposed a safety valve action theory of aqueous drainage mechanism which postulates that there is no flow of aqueous at normal intraocular pressure but that when this pressure is raised there is drainage of aqueous into the drainage channels. However others have demonstrated a continuous aqueous outflow in man. Since previous methods of measuring the pressure in the drainage channels were done with a cannula under unphysiologic conditions the author has suggested a new method on a completely intact rabbit's eye. Previous experimentation has shown that unilateral closing of the common carotid in rabbits reduced the mean blood pressure in the ophthalmic artery about 30 to 40 mmHg from a normal level of 100 mmHg and the intraocular pressure by about 4 mmHg of mercury from the normal level of about 30 mmHg.

The author injected radioactive sodium isotope Na (24) intraperitoneally and later measured the sodium concentration in the aqueous drawn from both eyes. Carotid occlusion hardly (or not at all) changed the equilibrium concentration of the sodium in the aqueous, and showed that the relative change in aqueous outflow caused by carotid closure must be very nearly equal to the relative change in the rate of entrance of sodium. Calculations further showed that the reduction in rate of entrance of sodium was about 7 per cent, which then very nearly represented the reduction in aqueous outflow caused by carotid occlusion. This result certainly does not support the idea of an overflow mechanism in the intact rabbit's eye. A drop of 10 to 15 per cent in the intraocular pressure should have given a much more pronounced reduction in aqueous outflow if an overflow mechanism had really existed. Therefore there must be some kind of a relative stabilization of rate of aqueous flow. It was assumed that the outflow of aqueous consists of two parts—a hydrostatic part which changes directly with the intraocular pressure and an osmotic factor which is more or less constant. However the blood in the drainage vessel becomes more or less diluted by aqueous humor when it absorbs the efflux

from the anterior chamber which reduces the osmotic attraction along the path of the blood through the vessel. When the intraocular pressure rises more aqueous humor is forced out hydrostatically the dilation will become greater and the colloidal osmotic attraction consequently smaller. When the intraocular pressure falls, the blood in the vessel becomes less diluted and the colloidal osmotic attraction for aqueous rises, which produces a mechanism that tends to maintain a relatively constant flow of aqueous humor in spite of a changing intraocular pressure—the direct opposite of an overall w mechanism. Thus, the osmotic factor in the aqueous outflow mechanism reduces the efficiency of the drainage mechanism in its role of stabilizer of the intraocular pressure. This constant aqueous flow may be a mechanism for protecting the lens. What the situation is in man remains to be seen since man has no trabecular vein. ROBERT H. JOHNSON, M.D.

EAR

House H. P.: Indications for the Fenestration Operation. *Arch Otolaryngol* 94:7 45 3

In selected cases of clinical otosclerosis the fenestration operation has proved of definite value in restoring practical, serviceable hearing.

It is generally accepted that any patient with a bilateral conductive type of hearing impairment who has intact ear drums and patent eustachian tubes and who does not exhibit other obvious pathologic conditions of the ear may be considered as having clinical otosclerosis.

The degree of function of the cochlear nerve is determined by both the tuning fork and audiometric testing. If the patient with clinical otosclerosis has loss of serviceable hearing the duration of bone conduction over air conduction with a 1024 fork is in direct proportion to the degree of cochlear nerve function present. This simple procedure serves as a ready means of confirming the audiometric findings.

Candidates for the fenestration operation may be classified as ideal, borderline and unsuitable according to the amount of nerve function present in the speech frequencies.

Group 1: ideal candidates for fenestration. The members of this group hear the 1024 Muellier magnesium alloy 1024 tuning fork 10 seconds or more longer by bone conduction than by air conduction, and their nerve loss as shown by audiometry is 1 decibels or less for the speech frequencies.

Group 2: borderline candidates for fenestration. The members of this group hear the 1024 fork from 5 to 10 seconds longer by bone conduction than by air conduction. Their nerve loss as shown by audiometry does not exceed 20 decibels for two speech frequencies and is not more than 30 decibels for the remaining 1024 frequency.

Group 3: candidates not suitable for fenestration. The members of this group hear the 1024 fork longer by air conduction than by bone conduction. Their nerve loss as shown by audiometry is more than 30

decibels for two speech frequencies or more than 30 decibels for the remaining 1024 frequency.

If the curve of nerve function continues downward in the frequencies above 1024 the prognosis does not seem as good as it does in the cases in which the curve continues at the same level in the higher frequencies.

A total of 40 patients were classified as of group 1. Of these, 30, or 75 per cent, have maintained practical, serviceable hearing longer than 6 months.

A total of 62 patients were classified as of the borderline group. Of these 34, or 55 per cent, have maintained serviceable hearing longer than 6 months.

Among this series of 112 persons who were observed for more than 6 months after they underwent the fenestration operation for otosclerosis there were no serious complications. Three thought that their hearing was worse after the operation, but audiometric studies revealed both the bone and the air conduction curves to be at the preoperative level.

Six persons belonging to the third group were operated upon with the following results: 3 obtained restoration of practical serviceable hearing, 3 showed an audiometric gain but hearing did not reach the serviceable level, and 1 of them, operated upon for tinnitus obtained relief. JOHN F. DEANE, M.D.

NOSE AND SINUSES

Daley J.: The Role of Columellar and Septocolumellar Sutures in Rhinoplasty. *Arch Otolaryngol* 1947 45 78

Daley states that 90 per cent of all artistic errors in rhinoplasty are centered around the nasal tip, involving the columella, nostrils, septolabial angle and philtrum. He discusses the method of using various columellar and septocolumellar sutures and describes the indications for its use in detail. Sutures should be under as little tension as possible to prevent distortion of the neighboring tissues. The orthopedic suture of Joseph which is used to accomplish elevation of the tip and columella of the nose is most successful when a small bite of the columella not including cartilage is taken. A columella belly suture is recommended to prevent tightening and to keep the columella bowed caudally when the orthopedic suture is used. A ventral septocolumellar suture is recommended to elevate only the tip of the nose for correction of "polly beak." The straight columellar suture is used for closure of the crura of the columella. The perforating suture facilitates implantation of cartilage into the columella through the incision in the membranous septum and permits the cartilage to be maintained in position until manipulations have been completed after which the suture is removed. JOHN R. LEWIS, M.D.

Gatewood W. L.: Substitution of the Chisel for the Saw in Reconstructive Surgery of the Nose. *Plast Reconstr Surg* 9:47 149.

This writer believes that the use of the chisel over that of the saw is of advantage in the operation for

reconstruction of the oversized nose. The advantages are summed up as follows:

- 1 There is definite saving of time and energy
- 2 The severed bone surfaces are left smooth and clear
- 3 There is less trauma to the soft tissues.
- 4 There is no bone dust to produce osteogenesis

A description of the operative procedure is given and 18 drawings are included to illustrate the operation.

WILLIAM A. ARNOX, M.D.

MOUTH

Kanthak, F. F. and Dubrul, E. L.: The Immediate Repair of War Wounds of the Face. *Plast. Reconst. Surg.* 1947 3: 210.

During time of war the problem of immediate or delayed closure of soft tissue wounds assumes greater importance. The authors present their experiences and conclusions reached after the immediate repair of over 450 war wounds of the face. Since gas gangrene and tetanus arising from injuries of the facial structures is virtually unknown it is considered much safer to close wounds of this region immediately. In the early months of the war authorities immediately in their opinions on how to best treat war wounds of the face, but in general the instructions were divided one to debride sparingly to suture skin to mucous membrane where tissue loss existed and not to resect facial wounds early but to allow them to granulate first and then do a secondary repair. The objection to the delayed suture of facial wounds is that in addition to the increased danger of secondary hemorrhage the convalescence of the patient is lengthened and he is not ready for transport so soon as would otherwise be possible. The functional and cosmetic results produced by delayed treatment are not superior to those of primary repair and the discomfort of the patient with a partial loss of a cheek or lip is increased by delay in repair.

The repair of these wounds was done usually within 48 hours after injury. This delay was due to problems in transportation and limited operative facilities. In general, endotracheal anesthesia was used for severe injuries involving the oral or nasal cavities. The bony injuries are repaired first because of the ease of access. Large fragments are extracted, those places having attachment being repositioned, and apparatus is installed on the teeth remaining at this time for fixation of the fractures. Gauze packing is utilized for the thin bones of the middle third of the face to mold them into position. After the bony injuries have been treated the soft tissue is attended to. The margins are trimmed of devitalized tissue, the debridement being extended to an area of good visibility. The mucosa and muscular layers are first closed separately. The mucosa is sutured with interrupted stitches of fine silk, the knots being tied on the oral surface to expedite suture removal. The muscular layer is joined by interrupted stitches of 4-0 chromic catgut or fine silk. It is believed that

closure of the wound in layers is important to produce dispersion of the scar and therefore minimal subsequent contraction of the sutured area. The skin defect is closed with sliding flaps, rotation flaps or interpolated flaps of skin and subcutaneous tissue or more rarely by the use of the free skin graft which serves primarily as a physiologic dressing restricting the full development of contractions. In closure of the skin, the tension is relieved from the cutaneous margins by generous undercutting and by the use of fine white silk or 4-0 plain catgut passed through the deep layers of the skin. The skin itself is sutured either with fine black silk or fine nylon.

Closure of the skin defect by these methods usually places the skin suture line in a different plane than that of the deeper layers in an important protection against contraction of the healing wound in a deformed manner. Whenever possible small inter-polated flaps of skin and subcutaneous tissue are utilized in closure to avoid contracting pulls in straight lines.

All wounds communicating with the oral or respiratory cavities are drained at one or more dependent points by means of rubber tissue. The wound is dressed with a single layer of rubber tissue. The wound is several most dressings to absorb any immediate bloody ooze. Over these are laid a number of gauze dressings and, finally, an elastic cotton bandage is applied over all.

Not over 5 per cent of facial injuries required tracheotomy. Repositioning of the fractured jaws with adequate fixation and the use of adequate pressure dressings to minimize postoperative swelling kept the incidence of respiratory difficulties at a low level. By these procedures the patient is made more comfortable, requires less nursing care, and can be transported earlier than would be possible by delayed treatment.

FRANK F. KANTHAK, M.D.

New G. B. Congenital Cysts of the Tongue the Floor of the Mouth, the Pharynx and the Larynx. *Arch. Otolaryng.* 1947 45: 145

Congenital cysts of the tongue, floor of the mouth, pharynx, and larynx are rare but are particularly interesting because of the difficulty in their diagnosis and the problem of their complete removal. The patient may complain of repeated flare-ups due to infection of some part of the tongue, pharynx or larynx. At the time of such flare-ups due to infection and some fluid may be discharged into the mouth or throat but at the time of the examination nothing can be found to account for the symptoms. One must consider an infected congenital cyst as a possible cause. At times one sees patients who have had such symptoms many years without a diagnosis having been made. Congenital cysts that are not infected may produce no symptoms other than those due to their increase in size.

The term "ranula" has been used to designate a cyst of the anterior part of the floor of the mouth. It should be used only to designate the thin walled

epithelial lined cysts that grow slowly are sometimes of a bluish tinge, and are soft and easily compressible. These cysts fluctuate but do not pit on pressure. They may be present at birth or may appear shortly afterward. They are readily distinguished from a dermoid cyst because of the thinness of their walls. There is no urgency about removal of a ranula unless it is causing difficulty in breathing or eating due to displacement of the tongue. Complete removal of the cyst is the treatment of choice. As the wall of the cyst is very thin, dissection must be carried out very carefully in order to remove all of the lining. The larger cysts may be opened and the lining destroyed by superficial surgical diathermy.

A cystic hygroma is a multilocular lymph cyst which usually occurs primarily in the neck but may involve the floor of the mouth. A cystic hygroma usually is found in the floor of the mouth or in the submental or submaxillary region. These cysts are multilocular lymph cysts. They have thin walls and an endothelial lining they usually are filled with clear lymph. They are retention cysts due to obstruction or lack of development of the afferent lymph vessels. Examination discloses a smooth thin cyst in the floor of the mouth, which causes bulging of the tongue. Palpation of the neck reveals an enlargement on one or both sides. Surgical removal is satisfactory if the patient can stand the operation. At the Mayo Clinic, however they have treated nearly all of these cysts with external irradiation or radon seeds.

A dermoid cyst which involves the floor of the mouth and the submental and submaxillary regions may be situated either above or below the mylohyoid muscle, or may extend from one region to the other through the muscle. The large cysts cause bulging of the floor of the mouth. The tongue may be back against the pharynx and may not be visible. The submental region may be filled out like a large orange. They may occur in infants and interfere with feeding and deglutition. In the differential diagnosis of the dermoid cysts, one must think of enlargement of the sublingual or submaxillary glands and of a salivary calculus. Complete removal of a dermoid cyst is advisable and the approach should be made either externally or through the floor of the mouth, according to the location of the largest part of the cyst. If the cyst is to be removed through the floor of the mouth, an incision is made over the tumor and, after the wall is exposed and a line of cleavage is established, the cyst may be removed by blunt or finger dissection. Even cysts which have extended submentally may be pulled up through the muscle and removed through the mouth. Cysts that are situated in the submental region and have not extended very far into the floor of the mouth or are badly infected are best removed externally through a submental incision.

Aberrant thyroglossal cysts may cause repeated inflammatory swelling of the base of the tongue if they become infected. If a portion of the cyst remains below the hyoid bone, it produces swelling

in the neck or a thyroglossal sinus externally in the midline. If there is incomplete obliteration of a thyroglossal duct and a portion remains in the region of the foramen cecum, repeated infection may cause a great deal of trouble. The treatment of this lesion consists of removal of the cyst or cystic tract in the interval between infections.

Branchial cysts may be present laterally in the pharynx in the region of the posterior pillar, or below the tonsil or in the hypopharynx and at the base of the tongue. The opening of the branchial cysts may be enlarged under suspension laryngoscopy and the cystic tract destroyed by surgical diathermy with a protected point. A congenital cyst of the larynx or a branchial cyst which extends laterally in the region of the vallecula may be removed under suspension laryngoscopy by surgical diathermy.

Congenital cysts of the larynx may not produce symptoms until adult life or may cause death because of laryngeal obstruction by the mass present at the base of the epiglottis and side of the larynx. Lateral thyrotomy, division of the thyroid cartilage and dissection of the cyst with a cotton applicator without exposing the larynx itself has proved to be a very satisfactory operation for complete removal of these cysts.

Sharp, G. S., and Spickerman, H. D.: Cancer of the Tongue. *Am J Roentg* 947: 57, 8.

The authors report 5 year cures in 31.3 per cent of 8 cases of carcinoma of the tongue treated by roentgen therapy combined with interstitial radium therapy. Excessive smoking and dental trauma to the tongue were considered common etiologic factors. Lingual carcinoma was found to metastasize and infiltrate early. Immediate biopsy and histologic irradiation was considered important.

The number of 5 year cures was found to vary with the location, decreasing progressively in the following order: tip, borders, dorsum, and base. The more adult type of epitheliomas occurred at the tip, and the anaplastic, high grade, embryonal cell type occurred at the base. Over 90 per cent of all the cases were epidermoid carcinomas.

The authors believed that dissemination of carcinoma cells due to infection was prevented by treatment with penicillin and sulfa drugs. The primary lesion was treated exclusively by irradiation combining x ray therapy with the subsequent implantation of radium needles. Whenever possible roentgen therapy was given through the mouth, however for lesions at the base of the tongue supplementary external radiation was necessary. By using a short target-skin distance the total dose of roentgen therapy given by the method described varied from 4,000 to 4,800 roentgens given in from 10 to 12 days. Subsequent radium needle therapy was given in the average total dose of 100 mgm. hr. to the anterior two-thirds of the tongue and of 800 mgm. hr. to the base of the tongue. Soft tissue breakdown and osteonecrosis was minimized by this method.

JOHN R. LINDVAT, M.D.

Klein D: Classification of Maxillofacial Injuries Plast. Reconstr. Surg. 1947 : 133

The author reviews a series of cases of maxillofacial injuries admitted to an evacuation hospital. A plan of care was evolved in which evaluation of the injuries and classification of the varying degrees of such injuries were made. This plan made possible more accurate diagnosis and a better approach to treatment and prognosis. The application of these findings to civilian practice has been noted by the author.

Because of the wide variation in the extent of the injuries and problems involved in caring for the patients group classifications were made.

- Group 1 Primary maxillofacial injuries
 - (a) Without hemorrhage or obstruction
 - (b) With (1) hemorrhage (2) obstruction
 - (c) or (3) both
- Group 2 Maxillofacial injuries with concomitant wounds

The patients in group 1 a were usually comfortable with little need of sedation and they exhibited few if any signs of clinical shock regardless of the severity of the injuries. Extensive primary repairs were well tolerated.

The patients in group 1 b suffered in addition from noticeable loss of blood respiratory obstruction, or both they were acutely ill and presented many manifestations of clinical shock.

Treatment was directed to replacement of the lost blood and the establishment of an adequate airway. When these criteria were met, primary reparative surgery of any degree was carried out as in the first group.

In Group 2 with facial injuries and concomitant cerebral, thoracic abdominal or extremity injury treatment of the facial injuries was carried out currently with that of the other injuries in the belief that recovery was not compromised and minimal scarring and deformity were the result. The principles of immediate reparative surgery or early repair were adhered to and emphasized, and particular attention was paid to patients developing unexpected signs and symptoms. Concealed injuries were suspected in these cases.

Excellent case histories illustrate the course and treatment of the cases in each classification the medical surgical and mechanical data are complete.

FREDERICK W. MERRIFIELD M.D. D.D.S.

PHARYNX

Révész, G: The Role of Mechanical and Anatomical Factors in the Problem of Tonsillar Foci.
J. La. Med. Assoc. 1946 61: 390.

Révész believes that the anatomical location of the palatine tonsil between the superior constrictor laterally palatoglossus anterior palatopharyngeus posteriorly and tongue inferiorly renders it susceptible to pressure or massage during swallowing. He found on experimentation that radiopaque material was more slowly expressed from the crypts of deep

scated tonsils during deglutition. From this observation he reasons that the products of bacterial action when present are expressed into the oral cavity from superficially situated tonsils but toward the capsule from those deeply seated. The central pressure tension exerted by these muscles mainly those in the pillars is calculated to be about 0.45 kgm/cm². These findings are advanced in support of his contention that improvement is more frequent following the removal of deep seated tonsils when one is seeking to eliminate foci of infection.

JOHN R. LINDAY M.D.

Figl F A. Cicatricial Stenosis of the Nasopharynx; Correction by Means of a Skin Graft. Plast. Reconstr. Surg. 1947 : 97

Thirty-seven cases of cicatricial stenosis of the nasopharynx have been encountered at the Mayo Clinic. Many authors have stated that syphilis is the most common cause of cicatricial stenosis of the nasopharynx. This is decidedly in contrast to the findings in the cases observed by the author. Excessive trauma inflicted during tonsillectomy alone or combined with adenoidectomy induced the stenosis in 30 (54 per cent) of the 37 cases. Syphilis was causative in 8 (21 per cent) cases an indeterminate inflammatory process in 3 rhinoscleroma in 2 a lupus in 1 and an attempt at surgical correction of a congenital malformation of the throat in 1. The duration of the stenosis at the time these patients came for consideration varied greatly. Narrowing of the nasopharynx in these cases may range from slight asymptomatic contracture to complete closure. The symptoms of stenosis of the nasopharynx are essentially those of accessory anuses and commonly are referred to the nasal obstruction and to the ears. They are dependent to a great extent on the degree of stenosis. Attempts have been made to reline the nasopharyngeal lumen by means of a skin graft but usually these have failed because the graft was inadequately immobilized.

In the following case an acrylic obturator was used and an excellent result was secured.

The patient a housewife aged 50 years came to the clinic for treatment on September 16 1946 because of nasal obstruction of 11 years duration. She had undergone tonsillectomy in 1932 and the wound had failed to heal. At that time results of serologic tests for syphilis were positive.

Examination of the patient at the clinic revealed dense cicatricial atresia of the nasopharynx complete destruction of the uvula, and extensive scarring of the entire posterior and lateral walls of the pharynx. No other clinical signs of syphilis were observed. On serologic examination reaction to the Kahn test was doubtful, results of the Hinton and Kolmer tests were negative, and results of the Hinton and Kolmer tests were negative, and examination of the cerebrospinal fluid gave completely negative results.

Antisyphilitic treatment with penicillin was begun and 5 days later surgical correction of the atresia of

the nasopharynx was undertaken. Local anesthesia was used. The tip of a heavy curved probe inserted through either nostril into the nasopharynx was barely palpable through the densely scarred palate but it was possible, by use of the probe, to determine the approximate level of the reflection of the mucous membrane on the posterior wall of the nasopharynx and the superior surface of the soft palate. A transverse incision, approximately 4 cm. in length was made across the posterior wall of the pharynx below the lower border of the scarred attachment of the soft palate to the posterior wall of the oropharynx. This was carried entirely through the thickness of the scarring and was then extended upward in order to free the palate widely from its attachment to the posterior pharyngeal wall. The opening thus created was enlarged sufficiently to permit insertion of the index finger through it into both choanae. A sponge rubber mold through which two rubber tubes had been inserted for nasal breathing was then covered with a split-skin graft of medium thickness. The graft had previously been taken from the anterior abdominal wall. This graft was drawn up into the restored nasopharyngeal lumen by means of two heavy silk ligatures attached to its upper surface and brought out through the nostrils. Although the sponge rubber mold was of such size and shape as to be self retaining supplementary anchorage was deemed advisable and was secured by tying together the traction ligatures mentioned previously, below the columella over a small rubber tube. In addition the edge of the palate and the pharyngeal incision were sutured directly to the skin graft and the mold supporting it.

Treatment with penicillin was continued postoperatively and the patient's convalescence was uneventful. The mold was removed for inspection of the graft on the tenth day. Complete take of the graft had been obtained. At the end of two weeks the sponge rubber mold was replaced with a self retaining acrylic obturator and the patient was dismissed from the hospital. The obturator was taken out for cleansing on alternate days and was worn for approximately 2 weeks.

The patient was dismissed from the clinic on the thirty third postoperative day. At that time the nasopharyngeal lumen measured approximately 1.5 cm. and had shown no tendency to contract since removal of the obturator a week previously.

NECK

Robertson, J. D.: Thyrotoxicosis as a Surgical Problem. *Brit. J. Surg.* 46: 34. 94.

The author presents a review of the literature and of his personal experience with iodine in the pre- and postoperative care of patients with hyperthyroidism. His work is divided into three sections, namely:

1. Iodine and iodide dosage in thyrotoxicosis, and its effect on the basal metabolism as a guide to operation. The preoperative use of iodine reduced the operative mortality for thyroidectomy in thyrotoxicosis

to less than 1 per cent. The mechanism of action of iodine on the hyperplastic thyroid is obscure, but it seems clear that iodide, free iodine, tincture of iodine, a strong solution of iodine (Lugol's solution), and calcium iodobenzoate are equally effective or the basis of total iodine, and that approximately 200 mgm. of iodine should be administered daily (by mouth). The common practice of giving iodine routinely for 10 days before operation is not approved by the author who showed that the basal metabolic rate often remains high for longer than 10 days after instituting iodine administration: some patients become refractory to iodine and the metabolic rate rises then, in spite of iodine administration. In such cases iodine should be withheld for several weeks then, usually on starting iodine therapy again, the metabolic rate falls to normal. Usually the pulse rate changes parallel those of the basal metabolic rate. Robertson states that the basal metabolic rate is the best guide for choosing the time for surgery.

2. The postoperative reaction after subtotal thyroidectomy for the relief of thyrotoxicosis. There is almost always an elevation of temperature for 1 or 2 days after thyroidectomy. That this is due to surgical trauma, and not to the liberation of thyroid hormone or any toxic substance specific to toxic goiter is shown by the fact that the same degree of temperature increase occurs after removal of nontoxic adenomas, of secondary glands of the neck, or of a chronically inflamed appendix. Blood pressure changes are also shown to be the same for different types of operation, and are not due to the type of anesthetic used.

3. The effects of iodine medication after subtotal thyroidectomy for thyrotoxicosis. Opinion varies concerning the value of iodine administration after thyroidectomy. The author compared a group of patients who received iodine both before and following operation with a group of patients who received iodine only preoperatively. On the average the preoperative basal metabolism of the second group (no postoperative iodine) was higher but normal metabolism was reached at about the same time postoperatively by both groups. Robertson therefore concludes that there is no value in the administration of iodine after subtotal thyroidectomy for hyperthyroidism. Finally he states that if iodine is not continued after subtotal thyroidectomy it is possible to state by the twelfth day after operation whether the thyrotoxicosis has been relieved. If the basal metabolism on the twelfth day after operation is higher than the lowest preoperative level or above normal limits, then the thyrotoxicosis has not been relieved. The basal metabolism is a more sensitive index of an unsuccessful operation for the relief of thyrotoxicosis than the pulse rate, the weight, or the clinical symptoms.

CLEGG, H. THOMAS, M.D.

Raveno, W. S. Propylthiouracil in Thyrotoxicosis. *J. Am. M. Ass.* 947 33 190.

The author reports his observations on 54 patients with thyrotoxicosis, who were treated with propyl-

thiouracil, a thiouracil derivative. The antithyroid action of propylthiouracil in rats is approximately ten times that of thiouracil, and while it is more toxic than the latter on a weight basis it is less toxic in quantities having a comparable therapeutic effect.

Clinical observations on the first 54 patients treated with propylthiouracil indicated that 30 to 75 mgm. and 15 to 50 mgm. a day is an adequate initial dose. The antithyroid action is less intense than that of thiouracil, myxedema and thyroid enlargement have occurred only infrequently, and side reactions not at all. This study gives the impression that propylthiouracil has about five times the activity of thiouracil with few if any of the disadvantages present of the latter.

Of the 54 patients treated with propylthiouracil during a period of 4 months, 18 had not received previous treatment. Of these 18 patients 13 had toxic nodular goiter and 5 had toxic diffuse goiter. Thirty-seven patients still on varying maintenance doses of thiouracil were given the new agent instead. Of these 13 had toxic nodular goiter and 14 had toxic diffuse goiter. Five patients who were unable to take thiouracil because of drug fever or urticaria were also included in this study.

In the group of 10 previously untreated patients with thyrotoxicosis, 10 responded with an abatement of symptoms, gain in weight and a return of the metabolic rate to normal within 4 weeks on the basal dose of propylthiouracil ranging from 50 to 75 mgm. a day. One patient responded after 21 weeks treatment and in 1 other patient responded after a period of 41 days. Five patients showed varying degrees of response, just short of complete control because of too low dosage.

Thirty-six patients on maintenance doses of thiouracil were given propylthiouracil instead. The disease in 13 patients continued under satisfactory control while that of 13 was not controlled as well again because of too low dosage. Apparently it takes at least 33 mgm. of propylthiouracil to match the effect of 100 mgm. of thiouracil, which would make the potency of propylthiouracil three times that of thiouracil. An effective initial dose comparable to 100 mgm. of thiouracil should accordingly be 300 mgm. of propylthiouracil daily.

In 2 patients typical drug fever developed with propylthiouracil but no other toxic reactions appeared. The five patients who had developed with thiouracil but no other toxic reactions appeared because of toxic reactions tolerated propylthiouracil without toxic reactions.

Evidence of a toxic effect on the blood, or the blood-forming tissues has not been noted in the present series of patients. Blood counts were performed every week at first then every 2 to 4 weeks. In no instance was there leukopenia, granulocytopenia, or anemia.

Propylthiouracil is a potent antithyroid agent fully as effective and much safer than thiouracil, although it too is capable of producing a toxic reaction, as has been demonstrated. JOHN H. MORGAN M.D.

Hinsworth, H. P., Morgans, M. E., and Trotter, W. R.: *Thyroidectomy and Thiouracil in Toxic Goiter: An Interim Comparison*. *Lancet* London 1947; 1: 241.

Subtotal thyroidectomy may be performed on the thyrotoxic patient as soon as he shows sufficient improvement in his condition from thiouracil therapy.

Ninety-one cases of toxic goiter were treated with thiouracil or methyl thiouracil. In 12 cases operation was decided upon at the initial examination. In these cases thiouracil was used solely to prepare the patient for the operation. In another 13 cases the drug had to be discontinued because of toxic effects and 1 other patient died of a coronary thrombosis during treatment.

A total of 65 cases of toxic goiter were treated with the thiouracil drugs. These cases were compared with a similar series of 93 cases treated by subtotal thyroidectomy. The pulse rate and basal metabolic rate both showed reduction during the first 3 weeks and there was a great similarity in this reduction due to both subtotal thyroidectomy and thiouracil. There was no appreciable difference in the condition of the patients treated with thiouracil and of those treated by subtotal thyroidectomy.

The authors state that the mortality from subtotal thyroidectomy is less than the overall mortality from thyroidectomy. They state, however, that thyroidectomy is advisable when tracheal obstruction is present when a drug reaction occurs and when the patient is unable or unwilling to attend regularly for review for an indefinite period.

Of 25 patients in whom the administration of thiouracil was stopped, 7 had a relapse but there was no relapse in 13 who had been under treatment for a year or longer. In the group as a whole, the longer patients were followed after the cessation of treatment the more frequently did relapse occur.

REINOLD J. BENNETT JR., M.D.

Vander Laan, W. P., and Swenson O.: *The Results of Surgical Treatment in Graves Disease*. *A. English J. M.*, 1947; 235-236.

In view of the many discussions regarding the relative merits of medical and surgical therapy in the treatment of hyperthyroidism, the authors have studied 149 cases surgically treated at the Peter Bent Brigham Hospital in Boston, Massachusetts from 1923 to 1940. Nineteen patients whose conditions were satisfactory at discharge failed to report back to the clinic therefore, the analysis pertains to 130 months.

Eighteen patients were studied for a minimum of 6 months. Nine suffered only mild hypothyroidism, and 7 had classic signs of myxedema. Of the latter 7 had metabolic rates ranging from 31 to 47 per cent. All 18 were given thyroid with satisfactory results.

Seven patients had unilateral vocal cord paralysis immediately after surgery. In 1 case it occurred after a hemithyroidectomy and the patient refused

the second stage of the operation. The 6 other patients suffered only a temporary paralysis.

Four patients showed hypoparathyroidism. In 3 there was evidence of permanent parathyropria. Tetany was produced preoperatively by hyperventilation. It was symptomatically controlled with vitamin D. Symptoms disappeared spontaneously after a few months in the 3 other patients.

Thirteen patients showed persistent exophthalmos. The Naessiger operation was performed on who showed a progression of exophthalmos. Of the remaining 18 patients, 3 showed marked exophthalmos.

Six patients had a recurrent thyrotoxicosis from 8 months to 4 years after surgery. Two were successfully treated with iodine. Two were reoperated upon; in 1 the result was successful but the other patient failed to return to the clinic. The remaining 3 cases were not studied.

Five patients had a persistence of the disease after surgery. Two were sent to radiologists. Two could not be followed up. The fifth patient was operated upon 3 times and made a complete recovery after the third operation.

Four patients died as a result of surgery. Two had a postoperative thyroid crisis and 1 had hemorrhage into the wound with cessation of respiration. The fourth fatality occurred in a woman who refused further treatment after a response to iodine. She continued taking iodine for 10 months after discharge. She was readmitted and iodine was withheld for 3 weeks. When it was again administered, she failed to respond. She died on the operating table.

One hundred and thirty patients were followed up for more than 6 months. One hundred and thirteen patients, or 87 per cent, had a satisfactory outcome. 17 or 13 per cent had either recurrence, persistence, parathyropria, vocal cord paralysis, and some died all of the results being considered unsatisfactory.

DANIEL REGEZ, M.D.

Puppel, I. D., LeBlond, C. P., and Curtis, G. M.: The Surgical Therapeutic Significance of the Functional Behavior of Thyroid Nodules. *Ann. Surg.* 947: 5-57.

The quantitative relations of thyroxine iodine, diiodotyrosine iodine, and inorganic iodine of excised thyroid tissue were determined, both for radioactive iodine and ordinary iodine.

The tissues were obtained at operation on 7 patients. There were 3 cases of nontoxic diffuse colloid goiter, one of which also exhibited a fetal adenoma, 3 cases of nontoxic nodular goiter, 1 case of exophthalmic goiter with 3 small colloid nodules, 1 case of nodular goiter with mild hypothyroidism, and 1 case of mildly toxic nodular goiter. In all of these the nodules exhibited a similar reaction to ordinary and radioactive iodine: the nodules showed less uptake of iodine than the surrounding thyroid tissue and manufactured less thyroxine and diiodotyrosine from the administered iodine than did the parathyroid thyroid tissue. Diffuse colloid thyroid tissue showed considerable avidity for administered iodine but

not much increase in production of thyroxine and diiodotyrosine. Diffuse hyperplastic tissue of exophthalmic goiter exhibited the greatest avidity for iodine and the greatest ability to produce thyroxine and diiodotyrosine. The question was raised as to whether the toxic manifestations in toxic nodular goiter are due to the nodules or to the parathyroid tissue.

CLARENCE H. TRENCH, M.D.

Outerbridge, R. E.: Malignant Adenoma of the Thyroid, with Secondary Metastases to Bone. *Ann. Surg.* 947: 125-132.

The present report is concerned chiefly with 5 cases of malignant adenoma of the thyroid with metastases to bone, seen at the Toronto General Hospital (Canada). In the last 50 years, 1,768 thyroidectomies were performed at this hospital. Sixty (3.4%) were done for carcinoma of the thyroid. Of these, 21 were diagnosed as adenocarcinoma or malignant adenoma of the thyroid. The 5 cases referred to presented similar metastases to bone: the symptoms first directing attention to the secondary tumor rather than to the lesion in the thyroid, and biopsy of the tumor showed that it was composed histologically of apparently quite benign thyroid tissue.

Case 1: A male, aged 49, had an 18 months history of a hard, painless lump the size of an olive in front of the right ear. This increased in size, and on admission he had a large pulsatile swelling, the size of half an egg, involving the right axilla, a smaller mass involving the fifth rib in the anterior axillary line, and a third pulsating mass over the second lumbar vertebra. A small nodule the size of a bean was felt in the right lobe of the thyroid. There was no evidence of hyperthyroidism.

Biopsy of the tumor in the right axilla proved it to be an extremely cellular mass, which reproduced fairly typical thyroid acini filled with colloid material in some sections. Other sections revealed colloid cells growing in small compact pseudocystic arrangement and in cylindrical cords. There was blood vessel invasion as well as atypical characteristics of the cells.

A right thyroid lobectomy was done, the lobe contained two nodules, (the left thyroid did not appear to be involved). The nodules presented the same characteristics as the metastases. Deep roentgen therapy was begun 1 month after admission, and 9 months later the patient presented metastases in the first and fourth lumbar vertebrae, the left pubic bone, and right wing of the ilium. Approximately two years later he was admitted because of large metastasis involving his left femur. He subsequently developed a spastic paraplegia and cord trouble. He died just 5 years after the onset of his trouble. Post mortem examination presented rather widespread metastases by more or less discrete growths which had shown little tendency to invasion of the surrounding tissues.

Case 2: A female, aged 73, entered the hospital with the history of a tumor of eight months duration and of increasing size in the left parietal region.

On admission the tumor was found to be a firm, painless nodule the size of a walnut lying deep to the skin and attached to the bone. The roentgenogram showed a punched out decalcified area about 1.5 cm in diameter. Her thyroid contained two small, firm painless nodules. The tumor of the skull was removed with the surrounding bone, and on microscopic examination revealed typical benign thyroid tissue.

Case 3. A female aged 41 was admitted with a 3 year history of occasional pain down the right forearm and wrist, noted chiefly on movements of supination. One and one half years before admission she had struck her right forearm, and following this she noticed the gradual development of a lump. On admission there was a firm, pulsating slightly tender mass the size of an orange involving the upper and outer aspect of the right forearm. X-ray films showed involvement of the upper one-quarter of the right radius, with the exception of the head and one half inch of the neck. There was complete destruction of the shaft of the bone leaving normal bone at each end. Biopsy revealed connected cords of acidophilic cells grouped in alveolar formation and containing colloid a typical picture of benign metastasizing tissue.

There was no evidence of hyperthyroidism, but there were two small palpable nodules in the right lobe of the thyroid gland. A subtotal thyroidectomy was done at which time two adenomatous masses were found, one benign and the other malignant. Following this, the tumor of the radius was resected.

Case 4. A female aged 67 was admitted with a history that following a fall 4 years previously she noticed the gradual onset of weakness and numbness of both legs. On admission she had complete loss of motor power of both legs and loss of pain touch, and sense of vibration below the xiphisternum level, and urinary retention. Roentgenograms revealed a tumor involving the fifth thoracic vertebra and the proximal portion of the posterior end of the fifth left rib. Laminectomy revealed a vascular tumor which, on microscopic examination revealed thyroid tissue of benign appearance.

The right lobe of the thyroid was enlarged. The patient was given a total of 4 courses of deep roentgen therapy to the thyroid gland and to the area of the fifth thoracic spine in the following year. There appeared to be no change in the thyroid but the neurologic status was improved.

Case 5. A female aged 30, was admitted with a history of adolescent goiter at the age of 12. There was no increase in size until recently. A thyroidectomy was done because of pressure symptoms and examination of the tissue demonstrated malignancy with invasion of blood vessels. Two months later the patient noted increasing weakness and numbness of both lower limbs and examination showed an incomplete spastic paraplegia, paresthesia and some sensory loss involving the lower portion of her trunk and lower limbs. Radiologic examination showed bone destruction of the seventh cervical and first tho-

racic vertebrae and spinal puncture demonstrated complete block in this region. A cervical laminectomy was done and since the lesion was so extensive only a biopsy was possible. This revealed a typical benign type of thyroid tissue. The patient was given a total of five series of telerradium to the region of the cervicodorsal spine. Gradual improvement resulted.

These cases illustrate the main features of the condition. Usually the patient first comes to the hospital because of symptoms produced by the bony tumors. Despite the benign appearance of the histopathology of these metastases a malignant primary focus can always be found in the thyroid gland. This primary process is usually a well encapsulated adenoma which has become malignant. In the present series only 33 per cent of malignant adenomas had formed metastases by the time the primary growth was removed from the thyroid gland. Metastases from this type of tumor have a predisposition for the osseous system. The metastatic tumors have a tendency to invade bone by growing in an expansible manner and eroding the bony cortex and the roentgenogram is suggestive of an osteolytic sarcoma or giant cell tumor. These bony metastases are frequently pulsatile and occasionally enlarge during menstruation and pregnancy.

Complete excision of the primary malignant adenoma and metastases would seem to be the most rapid and effective means of dealing with this problem. The effectiveness of this means of treatment depends on removal of both primary and secondary growths early and the slow growth of this tumor is in the surgeon's favor. His cases suggest that a period of at least a year elapses after the formation of the first metastatic tumor before others begin to develop. Deep roentgen therapy seems to have found a definite place in the treatment of this condition.

A plea is made for the recognition of the gravity of these lesions which should be reflected by early complete and adequate treatment.

LaROY J. KLEINBAUER, M.D.

DeMoraes Grey J. A Study of Thyroglossal Vestigial Tissues (Conduita em face dos "vestigios" tireoglossais). *Rev. Brasil. Cir.* 1947 16 31.

Aberrant goiter should be distinguished from so-called accessory supernumerary or remanent goiter, the latter being confined to the triangle formed by the lower jaw and both carotid arteries. The author reports 4 cases of cysts and fistulas in the last mentioned region.

Accessory goiters must be considered as vestigial formations in the region of the thyroglossal canal. They may be divided into upper or glossohyoid and lower or thyrohyoid groups. The fistulous tract may lie behind or in front of the hyoid bone or it may pierce it. A cure can be obtained only by complete excision of the tract. To facilitate the dissection the hyoid bone should be resected. When the dissection is finished the remaining portions of the hyoid bone are sutured with catgut. Injection of

methylene blue facilitates the visualization of the tract.

The operation can be performed under local anesthesia except in cases in which the goiter is located at the base of the tongue, when a general anesthesia with intratracheal intubation is preferable. Muscle tissue, aponeurosis and hyoid bone must be sacrificed to accomplish complete excision of the tract. While resecting the hyoid bone care should be taken to avoid the external carotid artery.

JOSEPH K. NARAY, M.D.

Lenz, M.: Cancer of the Larynx. *J Am M Ass* 947:134:17

Of 110 patients who received roentgen therapy for carcinoma of the larynx during the period from 1931 to 1941, 27 per cent were free from clinical evidence of cancer for 5 to 14 years. The remaining 73 per cent were not cured; either cancer persisted, or radiation edema, radionecrosis or metastases were present at death.

The principal factors influencing prognosis are (1) the local extent to which the larynx has been involved and (2) metastasis to the lymph nodes. When invasion of the arytenoid cartilage is incomplete or there is no fixation, 50 per cent cures (for 5 to 14 years) are obtained; when there is complete fixation only 12 per cent of the patients are free of cancer for periods of from 5 to 14 years. Among patients without clinically demonstrable metastatic lymph nodes, 33 per cent are cancer free after periods of from 5 to 14 years. Among those with metastasis when first seen, only 15 per cent are cancer free.

The microscopic classification of the cancer is of only slight prognostic significance since 37 per cent of both the well differentiated and the undifferentiated cancers are the group of patients who are

cancer free after from 5 to 14 years following roentgen treatment, while only 26 per cent of the moderately differentiated cancers are among the patients who remained cured after periods of 5 to 14 years.

Since the results following roentgen therapy in early cordal cancer compare favorably with those following laryngofissure and cordectomy and roentgen therapy results in a much better voice than can be obtained with treatment by laryngofissure, roentgen therapy is recommended as the treatment of choice in early laryngeal cancer. Laryngectomy is the treatment of choice if there is complete fixation of the arytenoid cartilages. In cases of partial fixation the author believes that a full course of roentgen therapy should be given and the decision for laryngectomy deferred for a period of about 3 months to determine if the treatment has eradicated the disease.

The usefulness of prophylactic postoperative roentgen therapy after laryngectomy is questionable. Radical neck dissection is advised if there are movable clinically involved nodes, whether few or many. When any lymph nodes are fixed, irradiation (roentgen or interstitial) is recommended.

Roentgen therapy is also recommended for cancer of the epiglottis, ventricular band, and anterior parts of the aryepiglottic folds even after fixation of the arytenoids and lymph node metastases. Cancer of the piriform sinus responds poorly to roentgen therapy.

A modified Coutard technique is employed, with a reduced daily dose and irradiated area to conserve normal tissue resistance. An average dose of 5,700 to 7,000 roentgens is given at the rate of 100 roentgens to each side daily over a period of 5 or 6 weeks, through as small a field as possible, usually 6 by 3 cm. or smaller when possible.

FRANK B. QUINN, M.D.

SURGERY OF THE NERVOUS SYSTEM

BRAIN AND ITS COVERINGS CRANIAL NERVES

Friedland, F. and Margolin, R. J.: *Physical Rehabilitation of Patients with Brain Injuries*. *Occup Ther Rehabil* 1947 26 8.

The authors have had experience with over 80 patients at the Cushing General Hospital. All of the patients were suffering with major brain injuries which had produced varying degrees of the cerebral type of paralysis as well as mental changes in some instances. It became obvious to the authors early in their work that the conventional forms of heat massage and passive exercise were alone not sufficiently effective to rehabilitate this difficult and entirely worthy group of patients. They found that it was necessary to teach posture, balance, co-ordination, and eventually ambulation, by special training which included re-education of all the muscles of the body.

The condition of some patients was such that individual attention was necessary; the treatments particularly beneficial to the special patient being administered by trained attendants. Gymnastics classes including group exercises and games, constituted the other major portion of the rehabilitation program. In all training, not only was an attempt made to regain the use of weak, spastic muscles and stiff joints, but also to develop co-ordination in all movements. Ambulation of course is the main goal of the paralyzed patient, but even with the most stately good muscle strength that most such patients have or can develop, they are helpless and without any feeling of security because of their poor co-ordination and defective sense of balance.

The patience and personal attention given this group of patients can be realized by the authors' descriptions of the various exercises, games, and devices used. The very fact that more than 75 per cent of the patients eventually became able to walk up and down stairs indicates the satisfying gains which can be accomplished by a carefully supervised rehabilitation program.

José MARTÍN ALD
Asenjo, A., Perino, F. R., García, E. and Gallo, A.: *A Handred Cases of Tuberculomas of the Central Nervous System* (Cien casos de tuberculomas del sistema nervioso central). *Rev méd Chile* 1947 75 1.

Of the 7-125 neurosurgical patients observed from February 20, 1940 to June 31, 1945, 187 were diagnosed as having tumor of the central nervous system, and of these 100 (4.14 per cent) were harboring tuberculomas. Sixty five of these patients were either operated upon or came to autopsy; the rest were diagnosed clinically. The ages of these patients ranged from 19 months to 58 years and there was a predominance of the male sex among those with cerebellar localization and of the female sex

among those with hemisphere localization. In nearly every case the living conditions had been poor; there was a history of anergic maladies (scarletina, measles, grip, frequent colds) in 58 and in 69 there was a concomitant tuberculous lesion elsewhere (pulmonary or pleural in 48).

A special study of the relationship between the intracranial lesion was made in 35 patients. In 6 of these the lungs seemed to be without tuberculous involvement. However the roentgenological examinations in this study was unsatisfactory as the roentgenograms postulated a completely normal lung in 2 of 30 lungs which later proved to be tuberculous anatomically and in 4 of 11 also proved to be tuberculous anatomically.

In 11 instances the neurologic manifestations were preceded for from 3 months to 3 years by pleurisy. Some of the roentgenographic studies had been made weeks and even months before the death of the patient; however it is possible that the pulmonary lesion found anatomically after death was the result of dissemination from the central nervous system lesion itself. All in all however the authors conclude that they are justified in assuming that in a large proportion of these unfortunate cases the nervous localization resulted from hematogenous dissemination of the tubercle bacillus from the pulmonary lesion.

In 38 patients the tuberculoma was single and in 27 multiple. In 42 the localization was cerebral (25 confirmed, 17 presumed) in 33 cerebellar (26 confirmed, 7 presumed) in 9 the brain stem was involved (5 confirmed, 4 presumed), and in 6 the lesion could not be definitely localized. In all cases the shape and progression of the lesion tended to be irregular and differed from that of the new growths in that initially the lesion was not space constricting but invasive with tubercle bacilli identified as much as 2 cm from the macroscopic borders of the lesion.

The histology is that usually described except in that the proliferation of the microglia in early lesions is believed to have been described for the first time. This study of the histology, microglia, and connective tissue reaction was made in 8 cases by the method of Del Río Hortega. Later when the process did become of a space constricting nature the manifestations of increased intracranial pressure tended to dominate the picture and constituted the chief indication for early surgical interference. The operation for early surgical interference has in the authors' experience been a simple decompression usually of the occipital region. Of course an attempt might be made to remove the lesion en masse when 1.5 cm of healthy tissue could be left on all sides. This possibility was present chiefly in tuberculomas of the cerebellar hemispheres. In the cerebellar lesions there

were several disadvantages from the surgical standpoint. In the cerebellum the lesion does not tend to get well spontaneously by calcification as often as it does in the cerebral tuberculoma; there is more tendency to extend in all directions; that is, more tendency to produce a block in the circulation of the spinal fluid; and there is more tendency to extend to the meninges. In this localization removal of an entire lobe of the cerebellum may be attempted when the condition of the patient and the results to be expected would seem to justify the extensiveness of the procedure. For the tuberculomas of the brain stem little or nothing can be done. One may attempt an occasional decompression or in selected cases the operation of Torkindsen.

As regards the prognosis, 57 of these patients have been discharged. Of these 57 were operated upon and 31 were not. Of the operative patients, 3 were discharged in a very grave condition. Of the remaining 54, 3 are known to have died; of these 3 had been operated upon. Of the remaining 51 only 13 could be followed up subsequently. Of these 13, 4 had not been operated upon and of these 4, 3 stated that their neurologic symptoms had ceased. The remaining patient retains a tendency toward convulsive seizures which however can be controlled by luminal. The remaining 8 patients had been operated upon. Of these all report that their symptoms have entirely gone or at least diminished to a great extent.

Forty-three patients have died. Of these 30 had been operated upon.

In general, the cause of death has been the evolution of the encephalic tuberculoma which frequently resulted in tuberculous meningitis. Occasionally of course, this condition was complicated by the presence of lesions elsewhere in the body.

JORGE W. BRIDGMAN, M.D.

SPINAL CORD AND ITS COVERINGS

Munro, D.: The Rehabilitation of Patients Totally Paralyzed below the Waist with Special Reference to Making Them Ambulatory and Capable of Earning Their Living. *England J.* 35: 947-36-2-3.

In the present article the management of the urinary system in anatomic and physiologic transections of the cord and cauda equina is clearly explained. The correct use of tidal drainage is the foundation of proper bladder training. Tidal drainage permits the bladder to be filled and emptied with control of the intravesical pressure and prevents puddling of residual urine and overstretching of the bladder. The use of tidal drainage centers about the type of bladder one has. This is determined by cystometrographic studies. Its action depends on the hydrodynamics of the siphon. Siphonage is activated whenever a predetermined intravesical pressure has been reached. An airtight siphon system must be maintained during emptying. The siphon is broken by admission of air when the blad-

der is empty. The apparatus is then in a condition which permits the cycle to start over again.

Adjustment of the siphon curve is very important and the stage of the bladder recovery should determine the height of the siphon curve. Bladder associated with injuries of the spinal cord or cauda equina pass through four stages. Immediately after injury, the bladder is atonic and the siphon curve should be 1 or 2 cm. above the bladder level. The curve should be set at 3 to 5 cm. above bladder level for the autonomous bladder at 15 to 18 cm. for the hypertonic bladder and at 10 to 12 cm. for the reflex or automatic bladder. The latter height should also be used in the normal bladder of a patient who is unconscious from a head injury.

The author states that in doing a cystometrogram, it is important to imitate the natural bladder in the rate of filling. One should fill it in increments of drops rather than increments of 50 c.c. He advises a rate of about 90 drops per minute. When cystometrograms are done carefully lesions affecting the bladder are shown as follows:

A transaction between C4 and S2 shows an immediate atony. The detrusor muscle does not contract at all. The internal sphincter closes tightly and the external sphincter is relaxed. Any emptying is the result of leakage through the internal sphincter and occurs because of the elasticity of the bladder wall and not by any contraction. In the absence of spinal shock infection and hypoproteins, the bladder will proceed to the next stage, known as the autonomous stage which is characterized by ineffective aborted emptying contractions. The detrusor muscle contracts and forces urine through the tight internal sphincter. It is called autonomous because it is believed that the neural control is in the intramural autonomous plexus. The next is the hypertonic stage. It is characterized by frequent contractions of the detrusor. The internal sphincter opens with each contraction and closes during the intervals. The external sphincter responds reflexly. The final stage is the reflex or automatic stage. The bladder empties completely with each emptying contraction and is deprived of all inhibitory influences. It is the best end-result that can be obtained in transecting lesions, but should not be considered the end-result in nontransecting injuries. In the latter the patient has the ability to relax and contract the external sphincter.

Lesions that are complete and involve the sacral segments or roots, or which involve the parasympathetic plexuses and denervate the bladder depend on the intramural plexus for neuromuscular control. In such cases the end-result is the autonomous bladder.

Wherever possible, activity should be of the reflex type. The bladder capacity should be at least 300 c.c. To prevent genitourinary infection, the fluid intake should be at least 3,600 c.c. per day. Bladder training is easier when the patient is ambulant, but should not wait because the patient is forced to be in bed.

DANIEL REED, M.D.

SURGERY OF THE NERVOUS SYSTEM

PERIPHERAL NERVES

Telford E. D., and Mottershead S.: The "Costoclavicular Syndrome." *Brit M J* 1947 1 315

Although the syndrome arising from pressure on the subclavian or axillary artery and the accompanying brachial plexus as they pass from the thoracic inlet to the arm is fairly well known consistent agreement as to the site and mechanism of the compression is lacking.

One hundred and twenty cases of this "costoclavicular" syndrome were analyzed with regard to their history and findings at operation. The causes varied: scoliosis of the cervicodorsal spine bands from the scapulae medius to cervical ribs and cervical ribs of varying sizes. In many instances no definite etiology could be found. It was apparent from these patients that no one mechanical cause explained all the symptoms and findings.

A case history is presented of a 33 year old male with numbness and tingling when his left arm was depressed or hanging down at his side. Operation disclosed that the axillary artery was visibly compressed while in the symptomatic position by two heads of the median nerve.

Observations were made with regard to radial pulsation with the arms in various positions in normal individuals. Although decrease and obliteration of the pulse were noted in some individuals in various arm positions the highest percentage of various changes was found when adduction against force was tested. Investigation was undertaken on the anatomical findings of the clavicular and axillary regions of cadavers with especial reference to the neurovascular bundle and its relations with the arm in a depressed position (as when hanging by the side) the retracted position (as with displacement of the shoulder posteriorly) and with abduction and adduction. Dissection revealed the believed explanation of symptoms.

Pulse alterations when the arm is in a depressed position are explained by compression of the axillary artery by heads of the median nerve which anatomically encircle the artery. When the arm is abducted these nerve cords do not cause pressure sufficient to stop the arterial flow but the artery is occluded by edges of the subscapularis and the pectoralis minor muscles.

Interference with the brachial plexus involves different structures. With depression of the shoulder even the superior and middle plexus trunks are tightly stretched across the scapulae medius. When the arm is abducted or retracted the middle third of the clavicle pushes the plexus bundle backwards against the anterior border of the scapulae medius and if resistance such as a cervical rib or abnormal first rib were present compression might easily occur.

It is believed that in the majority of patients suffering from the "costoclavicular" syndrome the plexus crosses a cervical rib a tendinous band an abnormal first rib or the scapulae medius symptoms

are produced when the arm is depressed and are those from involvement of the lowest trunk. A smaller group has symptoms when the arm is retracted or abducted believed to be due to interference of the entire plexus by the clavicle.

That the "costoclavicular" syndrome is caused by compression of the neurovascular huddle between the clavicle and the first rib is not supported by any anatomical evidence. C. FARRAR, KIRKIN, M D

Maróttoli, O.R.: Traumatic Paralysis from Tractation of the Common Peroneal Nerve (Parálisis traumática por tracción del nervio clítico popliteo externo) *Bo Acad Argent* 1946 30 1187

Three clinical cases of peripheral paralysis of the common peroneal nerve are reported. In all the mechanism of trauma was the same: a traction injury of the nerve trunk however the etiology was different in each case. In one patient the immediate cause was a fall on the right side with a forced varus deformity of the right knee. In a second patient the cause was an aviation accident with prominence of the head of the peroneus and widening of the entire knee with healing of the fracture of this joint. In both these patients the sensory and motor paralysis were immediate to the injury. In the remaining case an injury to the femoral artery resulted in a huge hematoma of the corresponding thigh with flexure of the hip and knee joints and external rotation of the limb. The hematoma was evacuated at operation and the limb fastened down almost straight on a splint reaching from the hip to the ankle and the next day the paralysis typical of this injury had developed. In 2 of these patients intraneural injections of iodipin afforded fairly reliable roentgenograms of the condition present in the remaining case the roentgenograms proved entirely unreliable.

In the first of the cited cases the indurated anatomical section of the nerve over the peroneal head was excised and immediate nerve suture was done. The attempt apparently failed completely. In the 2 other patients the condition was more recent the degenerative changes not so advanced and the nerve was simply elevated and brought forward so that the nerve trunk would not be under tension. In 1 instance the head of the peroneus muscle was resected with satisfactory recovery of function.

JOHN W. BRECKMAN M D

MISCELLANEOUS

Kirklin, J. W., Chenoweth A. I. and Murphy F. I.: Causalgia. A Review of Its Characteristics, Diagnosis, and Treatment. *Surgery* 1947 31 321

The cases of 52 patients suffering from causalgia have been reviewed by the authors. They wish to define causalgia as a clinical syndrome associated with a lesion of a peripheral nerve containing sensory fibers, manifested by pain in the affected extremity. This pain is usually of a burning character and is usually located in an area corresponding to the

to the cutaneous distribution of the involved nerve. An integral characteristic of this pain, one whose presence is necessary in order to make the diagnosis, is its accentuation by certain disturbing features in the affected individual's environment.¹¹

The pathogenesis of causalgia is discussed with the various theories advanced by previous observers. No satisfactory explanation has as yet been advanced to account for the phenomena.

A good many of the reported cases were explored surgically but no difference in the pathological condition could be demonstrated in the patients with causalgia as contrasted with other patients with peripheral nerve injuries who did not have this syndrome.

Microscopic sections were made of resected neuromas and gliomas, but failed to prove conclusively that causalgia exists only in incomplete anatomic lesions. From the clinical standpoint, the majority of patients exhibited evidence of an incomplete nerve lesion.

The various types of pain described by the patients have been analyzed as well as the factors which tend to aggravate the discomfort.

Treatment has included neurolysis, which generally has been ineffective, periarterial sympathectomy is discussed, although it was not used in the present series.

The authors believe that the best method of treatment at this time is sympathectomy. In the case of the upper extremity approach is made by resection of a portion of the third rib. The sympathetic trunk is sectioned below the third ganglion with division of the gray and white rami between the second and third ganglia in their respective intercostal nerves. The central stump of the sympathetic chain is then sutured into the intercostal muscles below the second rib.

In the case of the lower extremity resection of the second and third lumbar ganglia with the intervening sympathetic chain has been employed. Preoperative procaine block of the sympathetic chain has been employed but was not considered as essential in making the diagnosis nor in making the decision to employ sympathectomy.

The results have been tabulated according to the degree of relief as classified by the authors.

HOWARD A. BROWN, M.D.

SURGERY OF THE THORAX

CHEST WALL AND BREAST
Gaston, F. A : Plasma Cell Mastitis Surgery 1947
21 208

During the 15 years since it was first described, plasma cell mastitis has been a subject of increasing interest to surgeons and pathologists. That the case is one of apparent rarity is attested by the fact that only 43 cases have been reported in the literature to date. The purpose of this communication is to call this disease to the attention of surgeons again, and to report 3 new cases 1 of which presented unusual complications.

The term plasma cell mastitis was first used by Ewing to describe a benign inflammatory disease of the nonlactating breast. The first published report in which this term was used was presented by Cheate and Cutler in 1941 and was based on cases observed at the Memorial Hospital for Cancer and Allied Diseases, New York, New York. Two years later Adair presented detailed reports of the 10 cases observed at the same institution up to that time. Since these preliminary reports a number of additional contri-

butions have been made in the American literature. The importance of plasma cell mastitis lies in the case with which it may be confused with carcinoma. The disease occurs well within the age limits when in multiparous women and the interval since the last published reports the disease has invariably occurred in lactation has averaged from 1 to 5 years.

Adair has pointed out that the natural history of the disease may be divided into two phases the acute and the residual. The acute phase consists of the inflammatory reaction involving all or a portion of the breast, often associated with increased local heat, redness and mild tenderness. This phase is transient and the symptoms are usually so mild that the patient does not seek medical advice. After a variable period, ranging from a few weeks to several months the residual phase consisting of a non tender tumor is noted. The tumor is at times accompanied by discharge from the nipple which is variously described as watery, creamy, white or puriform. Nipple discharge was noted in 12 of the 34 reported cases in which these data were mentioned. In none of these cases has a bloody nipple discharge been noted, although in 1 case presented, such a bloody discharge was present for 5 months preceding operation.

Examination of the involved breast reveals a firm nontender tumor mass with an irregular and often ill defined border. The mass may occupy any portion of the breast but usually it partially underlies the areola. The nipple is retracted and the overlying skin is edematous which gives a typical peau d'orange appearance such as is seen in malignant lesions. The axillary lymph nodes are usually enlarged. Signs of local inflammation are entirely lacking.

The physical findings in plasma cell mastitis may so closely resemble those of carcinoma of the breast with attachment to the skin and with axillary metastases that many cases have been reported in which radical mastectomy was done without preliminary microscopic study of the biopsy material. The diagnosis may be suspected, clinically by eliciting a satisfactory history of the mild acute phase of the disease.

The gross pathologic lesion of plasma cell mastitis consists of single or multicentric nodules usually of a yellowish brown color occasionally with liquefaction, and forming abscesslike cavities.

On microscopic examination the most striking feature is the massive infiltration of the glandular and interstitial spaces with plasma cells. In some cases these are found in solid sheets cords and in round or ovoid masses. Foreign body giant cells are usually present sometimes in great numbers, which makes the differential diagnosis from tuberculosis a matter of concern.

A diffuse overgrowth of periductal connective tissue often causes partial obliteration of the duct lumen, and by extending into the supporting tissue accounts for the retraction of skin and nipple which is so commonly noted clinically. Dilated ducts often filled with cellular debris desquamated from the lining epithelium. Plasma cell mastitis may be indistinguishable from plasma cell tumor of the breast.

From the clinical standpoint it would seem that such symptoms as tumor nipple discharge and skin and nipple retraction could be satisfactorily explained on the basis of epithelial hyperplasia and periductal fibrosis. Perhaps the only part of the clinical picture which might be attributed to the plasma cell reaction is the early acute phase described by Adair.

From the histologic standpoint it is well known that plasma cells are found in a great variety of diagnostic processes in which they are considered important only as indicating the presence of an inflammatory process of long duration. Therefore if the plasma cell reaction is merely incidental to some other pathologic process the advisability of using the term plasma cell mastitis in this nomenclature of using the term this manifestation, which places stress on the other suffix to point out that plasma cell reaction has been made that plasma cell reaction be used as the same time the pathologic condition which may have elicited it should be given. Thus, case 1 might be termed glandular cystic hyperplasia with plasma cell reaction or chronic mastitis with plasma cell reaction while case 2 could properly be termed comedocarcinoma with plasma cell reaction.

In case 1 there was a sanguineous nipple discharge in view of the marked hyperplasia of the epithelium along the ducts it seems probable that this symp-

tom will be encountered in only a small percentage of cases.

Case 2 is of particular importance because it illustrates the concomitant development of a mesenchymoma in a breast which was the site of a plasma cell reaction. While this is the first case that has come to the author's attention in which the condition coexisted the epithelioid periplasmic cell by all authors suggests that such a combination is more than coincidence. The case together with that reported by C. W. Cutler in which the cause or microscopically identical histioma is used as a plasmacytoma, suggest that plasma celloma is while usually a benign disease has distinct malignant potentialities which may develop either possibly both of two directions as a malignant epithelial neoplasm if the metastatic nature is probably the result of differentiation of the hyperplastic epithelial cells or as a malignant plasmacytoma if additional factors intervene. Clark observed 2 cases in which local recurrence without distant metastases followed the removal of the tumor mass.

These observations would seem to lend the problem of treatment to require an immediate microscopic examination of frozen sections of the tumor to be carried out in all but a few cases. In the presence of which the clinical features are characteristic of malignancy. When the frozen section plasma celloma is established histologically, myeloma treatment would seem to be operation followed by at least 1 year of observation. If the etiology and natural history of the disease Section II myeloma part of the breast should then be carefully studied for evidence of malignancy. If evidence of local frequent removal of the peritumoral muscles and radical lymph node section are of course indicated. Even though histologic evidence of malignancy is not found, careful follow up examination for evidence of local or distant recurrence should be made for several years following the operation.

JOHN J. KIRKPATRICK, M.D.

TRACHEA, LUNGS, AND PLEURA

Miscall, L., and Harrison A. W. Thoracic Surgery in a Hospital Center. *C. Surg.* 94: 33.

Thoracic injuries fall into two large groups. Those in the first group demand immediate attention to save life and present problems concerned with the control of hemorrhage and the re-establishment of cardiorespiratory function. Those in the second group do not threaten life immediately and some delay in treatment is permissible. The problems they present involve the early maximal restoration of normal anatomic and physiologic relationships.

Operative and nonoperative measures are used in both groups but they are not mutually interchangeable. Conservative measures should be pushed to the limit when they will suffice. When they fail or are unsuitable operative approach is indicated. Success will be greatest when familiar with

with and regard for principles governing the application of both the operative and nonoperative principles and possibilities of the few of surgery needed.

STANLEY K. M.D.

HEART AND PERICARDIUM

Blum, R. J., Vandam, L. D., and Gray F. D. Jr. Physiological Studies in Congenital Heart Disease. Results of Preoperative Studies in Patients with the Tetralogy of Fallot. *Ann. Surg.* 117: 117-124, 1943.

The volume of blood flow through the pulmonary arteries was calculated in a total series of 120 patients with pulmonary stenosis according to the following formula:

$$\frac{\text{Oxygen content (ml per cent)}}{\text{Oxygen content pulmonary artery (1 percent more)}} \times \text{Oxygen content pulmonary vein (100 percent)}$$

In 35 patients with the tetralogy of Fallot the pulmonary artery per square meter of body surface was between 300 liters per minute which is normal cardiac output. The systemic blood flow was calculated according to the following formula:

$$\frac{\text{Oxygen volume (ml per cent)}}{\text{Oxygen content arterial blood (10 percent more)}} \times \frac{\text{Oxygen content of venous blood (1 percent more)}}{\text{per square meter of body surface}}$$

Cardiac output in 35 patients with the tetralogy of Fallot showed the rate of the systemic circulation to be increased as compared to normal. As a result of the increased flow through the peripheral circulation the difference between the oxygen content of the mixed peripheral arterial and venous blood was found to be normal. The total blood flow was approximated by the formula for the cardiac output and the systemic blood flow was calculated according to the following formula:

A comparison of the data obtained from the flow with those obtained for the flow in the pulmonary artery showed that the former exceeded the latter by from 0 to 60 liters per minute. In the tetralogy of Fallot there fore some flow returns to the mixed venous blood, which is pumped through the stenosed pulmonary artery. It is the flow through the interventricular septal defect and the overriding aorta directly into the systemic circulation. The overall direction of the blood flow is therefore was from right to left. However there is some concomitant flow from left to right through the septal defect. This is shown by the observation that the oxygen content of mixed venous blood exceeded that of the right atrium in many cases. The variations in systemic flow in patients with the tetralogy of Fallot are related to the degree of pulmonary stenosis and the size of the interventricular septal defect.

The pulmonary capillary flow (total pulmonary flow) was calculated according to the following

$$\frac{\text{CO}_2 \text{ output (ml. per min.)}}{\text{CO}_2 \text{ content of blood reaching alveoli (vol. per cent) minus CO}_2 \text{ content of pulmonary vein blood (vol. per cent)}} \times 100$$

In most younger patients the values obtained agreed closely with those determined for pulmonary artery flow. In most older patients the pulmonary capillary flow exceeded the pulmonary artery flow which indicated that the lungs received blood from sources other than the pulmonary artery. Direct observations of the collateral circulation during operation confirmed these findings. It is probable that the collateral circulation to the lung is an important factor in the physiological adjustment of these individuals to their abnormally low pulmonary artery flow.

Intracardiac and systemic blood pressures were obtained in a series of 22 patients with clinical and physiological evidence of the tetralogy of Fallot. The right intraventricular systolic pressure was elevated in 21. The pressures recorded ranged from 20 to 110 mm. above the normal values of 18 to 28 mm. of mercury. The diastolic pressure in the right ventricle was elevated in 8 cases. In many cases systolic pressure in the femoral artery was of the same order as that in the right ventricle. Changes in the peripheral resistance occur as a compensatory response to the alterations in flow.

Oxygen consumption in the great majority of patients with decreased effective pulmonary flow is reduced. The basal metabolic rate calculated from the figures obtained ranged as low as -48. The basal metabolic rate of patients with reduced effective pulmonary blood flow increased considerably following the performance of the Blalock-Taussig operation which raises the pulmonary flow.

During the standard exercise test the ratios of oxygen consumed and of carbon dioxide produced per liters of ventilation decreased, while the arterial oxygen saturation dropped immediately following

the exercise. Simultaneously the arterial carbon dioxide content increased. Inadequate effective pulmonary blood flow which causes the decline in the ratios of oxygen consumed and carbon dioxide produced per liters of ventilation, cannot be responsible for the changes in the arterial blood gases. Even in severely anoxic patients the blood reaching the left auricle is fully saturated with oxygen. It is therefore probable that shunts through the inter-ventricular septal defect and the overriding aorta are responsible for the fall in oxygen saturation and the rise in carbon dioxide content of the arterial blood during exercise.

SAMUEL KARN M.D.

ESOPHAGUS AND MEDIASTINUM

Schafer, P. W., and Kittie, C. F.: Esophageal Leiomyoma. *J Am Med Ass.*, 1947 133 1202

Benign tumors of the esophagus are very rare. Moersch and Harrington report 44 in 7,459 necropsies (0.59%). At the University of Chicago 11 were found in 6,001 necropsies (0.18%). About 200 cases have been reported. These include 12 varieties of tumor of which myoma is the most frequent.

Myomas are most frequent in the distal third of the esophagus. They are multiple in about one quarter of the cases and produce symptoms in about one tenth of the cases, i.e. only when the tumor is large. The symptoms are vague and indefinite pain, they are nonpathognomonic. Dysphagia is rare.

Four cases of surgical resection have been reported. The authors' case is the second successful surgical resection. The tumor was large (178 gm.) and had developed in the lower esophagus giving symptoms of intermittent pain in the right lower part of the chest over a period of 18 months and of acute pain for 2 days. The preoperative x-ray diagnosis was diaphragmatic hernia which was also present.

FRANK B. QUINN M.D.

SURGERY OF THE ABDOMEN

ABDOMINAL WALL AND PERITONEUM

Christopher F., and Penna, O J: *The McArthur Operation for Inguinal Hernia Surgery* 947
31 48

In evaluating a method of inguinal herniorrhaphy one must consider the type of hernia, the type of operation, the experience of the surgeon, the type of suture material, the age and occupation of the patient, the time of ambulation, and the care and accuracy of the follow up studies. Unfortunately in many published series the follow up data are based on questionnaire replies rather than actual examination.

In the last 4 years the authors have done 203 direct and indirect herniorrhaphies by the McArthur technique.

The technique employed by the authors requires silk throughout. The sac is transected and ligated and the stump is fixed or allowed to retract under the inferior oblique muscle. In small direct hernias the sac may not be opened. The cord is transplanted subcutaneously. The conjoint tendon and usually the transversalis fascia are sutured to Poupart's ligament by a continuous fascial suture prepared from the mesial border of the split aponeurosis of the external oblique muscle. One end of this suture is left attached to the symphysis pubis. When the cord is reached the suture is doubled back for a few bites. The end is securely anchored with 5 or 6 interrupted 00 silk sutures. With the cord elevated, the mesial border of the split aponeurosis of the external oblique muscle is sutured to the inguinal ligament with interrupted silk sutures. The outer layer of the aponeurosis is imbricated over it. The aponeurosis of the external oblique is imbricated above the cord, the lateral flap being uppermost. The opening for the cord is made large enough to admit a Kocher director in addition to the cord. Patients are encouraged to get out of bed on the first or second postoperative day and are sent home between the fourth and eighth days.

McArthur first described this operation in 1901. Since then Bigsard, Sachs, Joyce, and Ryan have endorsed the procedure.

One hundred and thirty hernia operations were done on 112 patients who reappeared for follow up examinations. Of these 71 were for indirect hernia, 31 for direct hernia, 7 for recurrent hernia, 2 for direct-indirect hernia, and in 1 case the hernia had no sac. In 18 cases the type of hernia was not specified. There were 106 male and 6 female patients with an average age of 46.6 years, the extremes being 19 and 75. The follow up period averaged 24.2 months, the extremes being 3 and 61 months. There were 3 deaths in the series: 1 from pulmonary embolus and 1 from pulmonary thrombosis. There were 4 known recurrences, a percentage of 3.1. Three patients had wound infections.

The authors list the recurrence rates of various surgeons who reported using this technique, and the overall recurrence rate was 3.1 per cent for 705 operations. Four surgeons using the Galle operation had a recurrence rate of 24.8 per cent for 1,139 operations. A comparison is then made with the results of 10 surgeons who used a nonfascia operation, in this group the recurrence rate was 7.1 per cent for 6,379 operations.

The authors then give short abstracts of the case histories of the 4 patients who developed recurrences.
ROBERT R. BIGSARD, M.D.

GASTROINTESTINAL TRACT

Benedict, E. B.: *The Limitations of Roentgenology and Gastroscopy in the Diagnosis of Diseases of the Stomach; An Analysis of 53 Proved Cases. Gastroenterology* 947 8 5

Gastroscopy supplements roentgenography in examinations of the stomach and in no way are the two competitive. In certain instances the roentgen examination appears to be superior to gastroscopy and in other instances the reverse is true.

The chief causes of failure in gastroscopy are mechanical. Once the gastroscope gets a satisfactory view of the lesion, his chances of reaching a correct diagnosis seem to be greater than those of the roentgenologist. Greater diagnostic accuracy is attainable when both methods are used co-operatively than when either method is used alone.

The author presents a series of 53 cases of proved gastric disease, including benign and malignant lesions. Case histories illustrate the limitation of x-ray and/or gastroscopy in each of various types of disease. In 19 proved carcinoma cases, the x-rays and gastroscopy both led to correct diagnoses in 10 instances. The diagnoses were both incorrect in only 1 case. In 8 cases, one method was more accurate than the other: 6 times in favor of gastroscopy and twice in favor of the x-rays. The author attributes this good showing for gastroscopy to recent mechanical advances. These improvements include the possibility of changing the angle of the mirror in American gastroscopes, and proximal control of the flexible part in 1 of the English instruments.

HAROLD LATTIN, M.D.

Farnett, F.: *Lymphogranulomatosis Primary in the Stomach (Linfogranulomatosis Isolata e primitiva dello stomaco). Arch. Ital. med. exp. 619*
947 3 3

A review of the literature shows that 16 cases of lymphogranulomatosis involving the stomach alone have been reported. To this number Farnett adds 1 in which a 38 year old man presenting the clinical picture of a gastric ulcer died suddenly of hemorrhage. Autopsy revealed changes in the stomach

wall suggestive of linitis plastica, with involvement of the regional glands. The mucosa of the stomach was found to be greatly thickened reaching at some places a thickness of 1.5 cm.

Microscopic examination of the stomach and lymph glands confirmed the impression of a malignant granuloma with the primary lesion in the stomach. The histological character of the affected tissue conformed to the phlogistic infiltrative category.

EDITH B. FARNSWORTH, M.D.

Orr, T. G.: A Modified Technique for Total Gastrectomy. *Arch Surg* 1947 54 279.

The author describes a new modification of esophagojejunal anastomosis in total gastrectomy. It is essentially an adaptation of the Roux-en-Y technique. The end of the distal portion of the jejunum is closed below the ligament of Treitz. It is then brought up either through the transverse mesocolon or in front of the colon and connected to the end of the esophagus by an end-to-side anastomosis. The proximal end of the jejunum is then anastomosed into the side of the jejunum below the transverse mesocolon.

The advantages of the technique described are (1) the direct entrance of the food into the jejunum distal to the anastomosis without filling of the proximal part of the jejunum as in the loop operation, (2) elimination of distention or delay in emptying of



Fig. 1. (Orr) Technique of total gastrectomy. The insert shows the type of paramedian incision used. The ligament of the left lobe of the liver has been severed and sutured beneath the right side of the abdominal wall to retract the left lobe. An incision has been made for the formation of peritoneal flaps and exposure of the esophagus.

the proximal portion of a loop, and (3) elimination of any regurgitation of the duodenal contents into the esophagus. The postoperative progress in 4 of the cases recorded was uneventful. In the fifth the

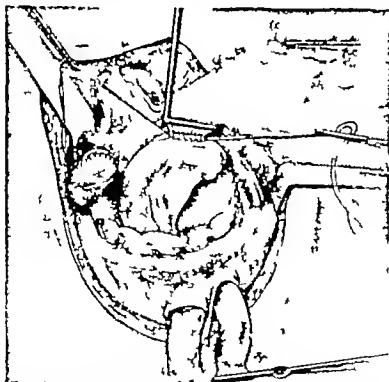


Fig. 2. Technique of total gastrectomy (continued). The jejunum is divided 15 cm. below the ligament of Treitz. The end of the distal portion of the jejunum is closed, and the first row of sutures and lines of incision are shown in the esophagus and jejunum as the first step in end-to-side esophagojejunostomy.

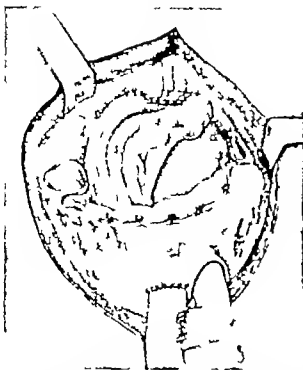


Fig. 3. (Orr) Technique of total gastrectomy (concluded). The end-to-side esophagojejunostomy is completed showing peritoneal flaps sutured to the jejunum over the anastomotic line of suture. Lateral sutures have been placed to fix and suspend the jejunum. Postcolic end-to-side jejunojejunostomy is completed. The mesentery of the colon is sutured to the jejunum and the mesentery of the jejunum to close the defect in the mesocolon.

patient died following a hemiplegia on the fortieth postoperative day.

The author suggests that with constantly improving method of supportive treatment for patients submitting to surgical procedures, and improvement and standardization of technique it seems reasonable to predict that the mortality rate for total gastrectomy in the future will not exceed from 10 to 15 per cent.

HAROLD LAUFMAN, M.D.

Moore, F. D., Chapman, W. P., Schultz, M. D., and Jones, C. M.: Resection of the Vagus Nerve. *J. Am. Med. Ass.* 1947, 33: 74.

Of 33 patients who were treated by vagotomy or vagus resection and observed for from 3 months to 2 years, 29 have shown good results clinically. Healing of the ulcer: the most uniform feature of this series. Recurrences have not been uncommon, but transient undesirable side effects occur and are found in about 10 per cent of the patients.

The decrease in fasting acidity and motility, which is so readily demonstrable after the operation, gradually returns toward normal until, at the end of a year, little abnormality of these factors can be found. The secretory response to insulin-induced hypoglycemia

remains abolished in most cases, and the clinical well-being of the patients also appears to outlast the duration of the early secretory and motility changes. This strongly suggests that, although the immediate relief of pain and the healing of the ulcer may be due to changes in the fasting motility or the secretion produced by the operation, any prolonged relief which the surgical procedure confers on the patient is due to some more subtle effect. This more subtle effect is probably traceable to severance of those nerve pathways which communicate the patient's adaptive reactions from brain to stomach. In patients suffering from peptic ulcer, impulses transmitted over these pathways in response to environmental situations often result in exacerbation of the disease. After resection of the vagus nerves, such impulses cannot reach the stomach and exacerbations of the ulcer do not occur.

SAMUEL KERN, M.D.

Evans, E. I. and Bigger, J. A.: Intestinal Strangulation. *J. Am. Med. Ass.* 1947, 33: 513.

Strangulation of the small bowel was responsible for more deaths in the hospitals of the Medical College of Virginia in the years 1941 to 1946 than appendicitis with rupture and peritonitis. Differentiation of simple obstruction and strangulation obstruction is paramount. Pain is the commonest symptom in obstruction of the small bowel. There is a dramatic onset of pain in strangulating obstruction. The incidence and frequency of repeated vomiting is greater in patients with strangulating obstruction. The patient with a strangulated obstruction usually appears extremely ill continuously.

The authors explain in detail the sign of "position of relief." It is thought that this "position of relief" reduces traction on the mesentery. Furthermore, this one position of relief is highly suggestive of strangulation of the bowel. Only after inspection, palpation, percussion, auscultation, and pertinent laboratory data can one make the proper diagnosis. There is no significant difference in the general appearance of the abdomen in the two types of obstruction. Abdominal palpation showed abdominal tenderness to be present in all cases of strangulation. Tenderness and muscular spasm usually mean strangulation. A palpable mass further clinches the diagnosis. In the laboratory data, a rising leucocyte count is suggestive of intestinal strangulation. A pulse rate above 100 in the earlier hours generally indicates intestinal strangulation.

In the management of intestinal strangulation a transfusion of whole blood is mandatory. Evidence indicates that some 1,500 to 2,000 c.c. of whole blood will be required to restore to normal the blood volume in this type of patient. A Levine tube should be inserted into the stomach and the stomach emptied by suction drainage. Dehydration is combated by intravenous isotonic solution of sodium chloride. Surgical operation should be carried out as soon as the patient is prepared, care being taken that not too long a time elapses between onset of the con-

SURGERY OF THE ABDOMEN

tion and operation. Shock and peritonitis in acute strangulation of the small bowel are usually due to avoidable delay in surgical intervention. Early diagnosis and treatment is the safest course.

Tables are presented which give all the data on the clinical cases and the physical and laboratory observations in intestinal strangulation. Table 3 lists the differential criteria in simple obstruction and strangulation. RICHARD J. BENNETT, JR., M.D.

Magney P. H. Acute Intussusception in Infancy and Childhood. *Minnesota M.* 1947 30: 257

The author presents an analysis of 58 cases of acute intussusception in infants and children admitted to 2 hospitals during the 25 year period from 1921 to 1945 inclusive.

The age incidence was as follows: 74 per cent of the patients were under 1 year of age; the highest incidence being at 6 months; 95 per cent were under 3 years. The youngest was 7 days old; the oldest 12 years. There were 35 males and 23 females.

Meckel's diverticulum in 2 patients was the only pathologic condition found at operation which could be considered as an etiologic factor. Vomiting was the most frequent symptom, occurring in 88 per cent of the patients. Cramplike intermittent abdominal pain was present in 70.7 per cent and bloody stools were noted in 63.8 per cent. Seventy-three per cent of the patients presented all of these symptoms and all had at least one of them.

Fever was present in 38 per cent of the patients. Abdominal masses were noted in 60 per cent and rectal masses in 20 per cent.

Nonoperative and postoperative measures to be used. Preoperative and postoperative measures to combat dehydration, toxicity or shock are essential and should be under the direction of a pediatrician.

Ether is the anesthesia of choice and was used by the open drip method, in 53 of the 58 operations. A right rectus incision was routinely made.

The types of intussusception were as follows: ileocolic in 49 patients; ileoileal in 5; colocolic in 4. The operative procedure was manual reduction in 49 patients. Additional operative procedures were appendectomy in 10 patients; some method of fixation of the intestine in 5 patients; and appendectomy and fixation in 1 patient.

Intestinal resections were performed in 7 patients. Five of these were combined with anastomoses, 1 with a double enterostomy and 1 with a single enterostomy. In 1 patient an anastomosis was made around the irreducible mass.

The intussusception occurred in 2 patients and a second operation was necessary.

The duration of symptoms is the greatest single factor responsible for the high mortality. The mortality rate rose from 18 per cent for the first day to 23 per cent for the second day and to 50 per cent for the third day.

Deaths in relation to the types of intussusception were as follows: 2 deaths in 5 cases of ileoileal (40

per cent mortality); 12 deaths in 49 cases of ileocolic (24.7 per cent mortality); and 1 death in 4 cases of colocolic intussusception (25 per cent mortality).

Of 49 patients treated by manual reduction of the intussusception, 8 died, a mortality rate of 16.3 per cent. Intestinal resections in 7 patients resulted in 4 deaths, a mortality rate of 57.1 per cent. There has been a progressive improvement in results in recent years. The first 10 years showed a mortality rate of 46.7 per cent as compared with 18.1 per cent during the last 15 years. There were 2 deaths among 17 patients operated upon in the last 5 years, a mortality rate of 11.8 per cent. EMMETT E. ARNHEIM, M.D.

Silverman D. N. and Leslie A.: Intestinal Tumors. *J. Am. M. Ass.* 1947 133: 904.

Six cases of inflammatory intestinal tumors of specific nature occurring as a complication of amebic or bacillary involvement of the intestine are reported. Amebic granulomas occurring as they do only in the colon cannot be distinguished radiologically from cancer. In most of the cases hitherto described and in 2 of those reported in the present article, the patients were subjected to unnecessary laparotomy because of the preoperative diagnosis of colonic neoplasm. Since there is such variation in therapy and prognosis it is important to distinguish amebic granulomas from malignant tumors.

Special attention is called to 1 case of ileocolic inflammatory tumor occurring in bacillary dysentery and 1 such tumor in combined amebic and bacillary disease. Although the occurrence of inflammatory tumors in the course of chronic bacterial dysentery is rare, such cases may be expected to occur with greater frequency in the future because of the present widespread dissemination of infection due to *Bacterium dysenteriae* throughout the United States.

The outstanding and almost universal characteristic of amebic granulomas is their response to specific therapy. There is a rapid resolution of large tumors after the administration of emetine hydrochloride. An amebic granuloma in which extensive fibrosis has taken place may require surgical intervention but this should not be considered until thorough amebicidal therapy has proved inadequate. In 3 of the cases reported, large tumors disappeared after medical therapy alone. A large granuloma associated with infection with *Bacterium flexneri* did not respond to autogenous vaccine therapy and surgical resection was successfully performed.

Rectal scrapings or even a biopsy if a tumor is within reach of the sigmoidoscope, can be diagnostic. If amebic granulomas are considered in the differential diagnosis of tumors of the colon, careful examination of the saline-purged stool will in most instances of amebic tumors, reveal the protozoan. In isolated instances, as in one of the cases of this series, the amebas are present only in the depths of the tumor mass and elude the parasitologist. Although it is contrary to scientific procedure to give specific treatment without a specific diagnosis, a case such

as this, which terminated fatally following surgical resection, gives one pause and in the younger age group at least, when the history is at all suggestive of dysentery a therapeutic test might well be justified. The problem of amebic granulomas is no longer regional, since cases are reported from northern areas.

JOHN L. LINDGREN, M.D.

Boriani, G.: Roentgenologic Picture of Bulbar Duodenitis of the Ulcer Type and Its Medical-Legal Importance (Quadro radiologico della duodenitis bulbare a tipo di ulcera sua importanza al fini medico-legali). *Radiol med Milano* 1947 33 15.

The clinical picture of bulbar duodenitis is revealed by a heavy feeling, pain, and a burning sensation melena may also be present. Usually the roentgenologic diagnosis is easy: small opacities or small cul-de-sac defects are seen between the mucous mucosa or otherwise, small ulcerations. Edema is a type of duodenitis however in which edematous nodules are arranged so as to make it difficult to differentiate between bulbar duodenitis of the ulcer type and a true duodenal ulcer.

It is noted, according to Akerlund, that the typical duodenal ulcer presents a three leafed clover appearance with 3 leaves on the base toward the pylorus and the third leaf above. In other words, a sessile clover without a stem. In bulbar duodenitis the picture is at times similar which may cause confusion, but there is a substantial difference in that either the clover has an inverted appearance with the 3 leaves above and 1 leaf toward the pylorus or if the clover is analogous in position to that found in duodenal ulcer, there is a small stem present which is not found in duodenal ulcer.

The authors cite the importance of this differentiation because duodenitis might easily be caused by the patient's eating an irritative substance, and, thus, a picture of duodenal ulcer might be produced intentionally for personal reasons. Many such cases were observed during the war in which there was no evidence of duodenal bulb deformity when the person was recalled back without warning in several days.

LUCIAN J. FRODOFF, M.D.

Rogers, H. M., Keating, F. R., Jr., Marlock, C. G., and Barker, N. W.: Primary Hypertrophy and Hyperplasia of the Parathyroid Glands Associated with Duodenal Ulcer; Report of an Additional Case, with Special Reference to Metabolic, Gastrointestinal, and Vascular Manifestations. *Arch. Int. M.* 1947 79 307.

A case is reported in which pronounced clear cell hyperplasia of the parathyroid glands and primary hyperparathyroidism were associated with healed duodenal ulcer. The parathyroid glands weighed 47.56 gm. Peripheral gangrene developed as a terminal event. Death resulted from renal insufficiency secondary to nephrocalcinosis. Pancreatic lithiasis and mild osteitis fibrosa cystica were also disclosed at autopsy. An unusual type of necrosis of the arterial

walls, with intimal calcification, appeared responsible for the peripheral gangrene. Gastrointestinal symptoms, which were presumed during life to be due entirely to ulcer, appeared in retrospect to have been manifestations of severe hyperparathyroidism.

Shallow, T. A., Wagner, F. B., Jr., and Morgan, W. B.: Enterogenous Cysts of the Duodenum. *Surgery* 1947 53 1.

Enterogenous cysts of the duodenum, in spite of their rarity should be recognized by the surgeon when they are encountered unexpectedly at laparotomy and a knowledge of the proper methods of treatment is essential.

The authors report the case of a 12 year old boy who had suffered recurrent attacks of high intestinal obstruction since the age of 1 year and who passed tarry stools prior to admission. His abdominal examination was negative. Laboratory studies revealed a moderately severe anemia and stools positive for blood. Roentgenograms of the upper gastrointestinal tract showed an elongated filling defect in the second portion of the duodenum with a slight irregularity of the defect, suggestive of ulceration. These findings were interpreted as being suggestive of a leiomyoma with ulceration in the second portion of the duodenum or of a gastric polyp prolapsed into the duodenum.

After correction of the anemia the patient was explored. Palpation revealed a semicircular mass about 3 cm. long in the second portion of the duodenum along the mesenteric border adjacent to the pancreas. Exploration through a gastrotomy incision showed no polyps nor stomach abnormality but, instead a smooth, circumscribed, semicircular mass arising from the wall of the second portion of the duodenum and projecting into the lumen. The duodenum was then opened opposite the mass, and the ampulla of Vater and the pancreatic duct orifice were identified at the upper border of the mass. From within the duodenum a transverse incision was made through the mucosa overlying the mass. With some difficulty the mass was excised intact from its submucosal position without rupturing through the posterior duodenal wall. The mucosal and longitudinal incisions were closed, thus re-establishing duodenal continuity. The gastrotomy wound was then closed before closing the abdomen in layers, without drainage. The operation lasted 1 1/2 hours and the patient was given 500 c.c. of blood.

The pathological specimen was a thin walled cyst, 2.5 by 2 by 1.5 cm., containing thick cloudy fluid. The lining was a duodenal type of mucosa and outer wall muscularis.

The postoperative course was uneventful, and follow-up roentgenograms at 4 months showed a normal mucosal pattern of duodenum at the site of the cyst. The patient was entirely well 1 year after operation.

The authors were able to collect only 13 other cases of enterogenous duodenal cysts from the world literature. These are briefly analyzed. In 10 cases the cysts occurred between birth and 4 months of age.

The oldest patient was 15 years of age. There were 3 males and 9 females.

Lewis and Thynge believe these cysts arise from detachment of knoblike diverticula which occur along the entire intestinal tract of embryos of man, the pig and the rabbit. Hughes and Jones believe that sequestration of embryonal intestinal epithelium early in fetal life may give rise to enterogenous cysts. Maddox favors the theory of origin from a vacuole arising during the so-called solid stage of the intestine which falls to gain communication with the developing lumen.

Although there are wide pathological variations these cysts are all adherent to some portion of the duodenum, all contain fluid and their walls are composed of all layers of the intestine.

In the authors' series 5 cysts were located in the first portion and 5 in the second portion of the duodenum. They were round or pear-shaped and from 2 cm. to 15 cm. in diameter. The contained fluid was clear and pale or cloudy and dark. In no case was a communication with the lumen demonstrated.

Multiple congenital abnormalities including multiple intestinal and biliary cysts, accessory spleens, transposition of the viscera, and a mediastinal cyst were observed in several cases.

Histologic examination of these cysts reveals a mucosal lining usually duodenal in type. The mucosal lining may at times correspond to other levels of the gastrointestinal tract. The smooth muscle coat is a constant feature of the lesion and it is adherent to or continuous with the muscularis of the duodenum, allowing no cleavage plane.

Enterogenous cysts are seen much more frequently in the ileocecal region.

Clinically these duodenal cysts produce obstructive symptoms by encroaching on the lumen. One may elicit a history of vomiting, intermittent colicky pain, a palpable mass, visible peristalsis, melena, anemia, and possibly jaundice depending on the size and position of the tumor and the degree of pressure and necrosis of the duodenal mucosa. X-ray examinations of the upper gastrointestinal tract, colon and kidney may aid in the diagnosis.

If a fluctuant mass is palpable, omental chylous, dermoid, pancreatic and choledochal cysts must be considered in the differential diagnosis. If the mass is more resistant, it may resemble hypertrophic pyloric stenosis, intussusception, renal tumor or leiomyoma.

In the absence of a mass, pylorospasm and congenital duodenal diverticulum, atresia, or adhesive bands must be considered.

Surgery is the treatment of choice and the method employed must be determined by the individual case. Excision of the cyst is usually mechanically impractical because of the continuity of the cyst and duodenal muscle layers. Injury to vessels during excision may lead to bowel wall necrosis, since the cyst and duodenum have a common blood supply. Excision from within the lumen was successfully carried out by the authors, and from without by Rogers. Resection of the duodenum containing the cyst and re-establishment of continuity is too formidable a procedure

in infants and in debilitated patients and not feasible when it would involve the pancreatic and biliary ducts. In poor risk patients window anastomosis to the adjacent duodenal lumen or to a loop of jejunum the segments of which are joined in an enterocostomy to divert the intestinal stream may successfully be carried out. Marsupialization can be undertaken if the cyst is large. Aspiration or catheter drainage is to be condemned. In 1 case gastroenterostomy alone to relieve obstruction was successful.

The high mortality (50%) is due to the early age of the average patient, and the frequently poor preoperative condition of the infants. The immediate and ultimate prognosis is good in the older patients (all 4 of the older patients recovered following surgical treatment). It is hoped that by more competent pre and postoperative care the higher mortality among infants can be reduced.

ROBERT R. BIGLOW, M.D.

Andrucci, M.: Osteopetrosis and Cancer of the Duodenum (Osteopetrosi e cancro duodenale). *Arch. Ital. chir.*, 1946 68 399.

The author describes a case in which cancer of the duodenum coexisted with an eburnating osteosis diffused throughout the whole skeleton. Two types of osteopetrosis can be distinguished: one in the child which is hereditary or congenital and the other in the adult which is acquired. The lesions found in adults may be regarded as primary and not as late manifestations of pre-existent lesions for the anatomic picture observed in adult patients is substantially different from that observed in children.

The eburnation process may depend on such vascular alterations as obliterating endarteritis secondary to chronic bone inflammation in which the reduced vascular activity can provoke a gradual sclerosis of the medullar tissue and a higher deposition of calcareous salts.

All the regions affected by osteopetrosis in the author's case had reduced circulatory activity because of vascular lesions of luetic nature and mechanical obstacles provoked by the small metastatic embolisms of the tumor. These lesions might be found in all organs including the skeleton.

ARTHUR F. CIPOLLA, M.D.

Griffin, W. D., Silverstein, J., Hardt, H. G. Jr. and Seed, L.: Prophylactic Chemotherapy in Appendicitis. *J. Am. Med. Ass.* 1947 133 907.

The benefits of prophylactic administration of penicillin and sulfadiazine in war wounds and in many varieties of surgical procedures have been demonstrated beyond doubt. Many surgeons however hesitate to subject all their surgical patients to a rather stereotyped regimen of prophylactic therapy. The authors report the results of the routine systemic administration of penicillin and sulfadiazine in a series of 108 consecutive patients operated on for acute appendicitis in the Cook County Hospital, Chicago. The circumstances per-

mit fairly accurate comparison with series of patients treated in previous years since the only difference in treatment has been the introduction of the routine use of penicillin and sulfadiazine in the present series.

Twenty thousand units of penicillin were given intramuscularly with the preoperative medication. This was followed postoperatively by 20,000 units of penicillin every 3 hours for 4 days. The patients also received 1 gm. of sulfadiazine four times a day for 4 days postoperatively. If the patient was unable to tolerate oral medication 5 gm. of sodium sulfadiazine in 1,000 c.c. of saline or dextrose solution was given daily by the intravenous route. In children the dosage of penicillin was the same as in adults but the dosage of sulfadiazine was reduced in proportion to the age of the patient.

The 108 cases were classified as follows: (1) acute suppurative appendicitis 62 cases; (2) acute gangrenous appendicitis 7 cases; (3) perforated appendicitis 19 cases. There were 77 adults and 31 children. There was only 1 death in the series. This patient was a middle aged obese woman with hypertension, severe diabetes and symptoms of 5 days duration, who died in a diabetic acidosis that did not respond to insulin treatment.

A table shows the death rate following appendectomy for the years 1928 to 1932 as 7.6 per cent, for 1937 and 1938 as 3.9 per cent, and for 1944 and 1945 as 4.3 per cent, as compared with a mortality of approximately 1 per cent which occurred in the present series.

In addition to the reduction in mortality there was a concomitant observable reduction in morbidity. The patients were more comfortable, had less abdominal pain and less abdominal distention, and were able to tolerate a full diet at an earlier date. In the past the majority of patients with perforated appendicitis had considerable postoperative ileus with abdominal distention. Only 1 patient in this series had a paralytic ileus severe enough to warrant the use of Wangenstein suction. Three cases of intra-abdominal abscess and 1 case of pelvic abscess were observed in this series. These abscesses subsided spontaneously on the continuation of the routine administration of penicillin and sulfadiazine. The use of penicillin and sulfadiazine seemed to prevent the development of severe infection in the wounds. There were 9 instances of wound infections. There was a definite reduction in the duration of hospitalization. Since no organized effort was made to send the patients home at an early date this indicates in general a shorter and less complicated convalescence. JOHN L. LINDQUIST, M.D.

Bartlett, R. W.: Management of Colostomies in the Fifteenth Hospital Center (England). *Arch. Surg.* 1947 54: 269.

War injuries to the large bowel are complicated in a high percentage of cases by other major injuries. Before closure is attempted, care must be taken that colostomy spurs are adequately obliterated, and that

edema of the bowel and active infection of the wound are no longer present. Compound fractures of the pelvic bones with osteomyelitis and purulent drainage in the neighborhood of the colostomy are an absolute contraindication to repair as failure will result because of infection in the wound. If a suprapubic cystostomy and colostomy coexist, the former should be permitted to heal before closure of the colostomy is carried out in order to avoid continual soaking of the wound with urine.

During the period of evaluation and preparation, the patients were maintained on high proteins, high caloric diets with multivitamins and full correction of any existing anemia or hypoproteinemia. Barium enemas and proctoscopic examinations were performed especially in cases in which there had been a rectal wound. In order to be sure that a perforation no longer existed at the time of repair, immediately before operation the patient was placed on a non-residue diet for 3 or 4 days and mild catharsis was instituted. Frequent irrigations of both colostomy loops were carried out.

Many closures can be kept extraperitoneal. In the case of closure of sigmoid colostomies, the author has employed a medium calibered latex tube as a safety valve above the suture line. Subcutaneous drains were placed in most closure wounds for 48 hours postoperatively. Penicillin and sulfadiazine in standard doses were used in perhaps half of the cases in this series. Since the advent of succinylsulfathiazole, this drug has been used routinely.

Of 398 colostomies, 238 were closed by simple transverse closure of the loop or closure following spur crushing, while 60 were closed by end-to-end anastomosis. There was 1 postoperative death. The author explains that this excellent result was probably due to the fact that the patients were vigorous young men undergoing elective operation, and that unlimited supplies of such essentials as blood, plasma and chemotherapeutic agents are available throughout the preoperative and postoperative periods. HAROLD L. CHASE, M.D.

Spottiswood, B. I.: A Case of Lipoma of the Descending Colon (Sopra un caso di lipoma del colon discendente). *Riv. internat. clin.* 147: 947-951-1945.

A lipoma of the descending colon was found in a 26 year old male patient who had the following symptoms: a sensation of insufficient bowel evacuation, constipation followed by diarrhea, and, at irregular intervals, severe abdominal pain in the left lower quadrant, distention of the abdomen, nausea, and vomiting. X-ray examination revealed an obstruction.

Through a left pararectus incision, a tumor was discovered in the midportion of the descending colon. The bowel was opened, and a submucosal mass the size of an apple with a 2 cm. ulceration was resected. The bowel was exteriorized. Eleven weeks later an end-to-end anastomosis was performed, and the patient made an uneventful recovery. ARTHUR F. CROSSLAND, M.D.

Calmenson, M., and Black, B. M.: Surgical Management of Carcinoma of the Right Portion of the Colon with Secondary Involvement of the Duodenum, Including Duodenocolic Fistula. Observations on 8 Cases. *Surgery* 1947 21 476

In 8 cases seen between 1907 and 1945 carcinoma of the right portion of the colon with secondary malignant involvement of the duodenum was treated surgically at the Mayo Clinic. The diagnosis of a duodenocolic fistula is usually made roentgenologically. The symptoms do not differ from those of a gastroduodenal fistula. Persistent diarrhea and a rapid loss of weight often accompanied by pain and anemia, are usually present and the occurrence of fecal vomiting is common. The second portion of the duodenum was involved in 7 of the 8 cases; the first portion in 1 case. In 2 of the cases involvement of the duodenum took the form of a duodenocolic fistula. Duodenocolic fistula secondary to malignant disease of the colon is a rare entity and occurs only when the disease is advanced.

The lesions were removed in one or two stages. In 7 of the 8 cases right hemicolectomy with local excision of a portion of the duodenal wall and duodenoplasty was carried out. In the remaining case segmental resection of the colon with partial gastrectomy and partial duodenectomy was done.

The risk of operation in these cases is high. There were 3 deaths in the hospital among the 8 cases. The prognosis in such cases is unfavorable. In the present series the longest survival period following operation was 1 year.

Rosser, C. and Kerr, J. G.: Pilonidal Disease. *J Am Med Ass* 1947 133 1003.

Prior to the recent war the preponderance of surgical opinion was in favor of the so-called open operation for the treatment of pilonidal disease. In contrast practically all the reports by medical officers of their experience while in service favor and advocate some attempt at closure. The latter recommendations appear to be about equally divided between methods of partial closure and complete primary suturing of the wound. The author points out that military conditions require a method of treatment that rehabilitates and returns a soldier to duty as quickly as possible since there is little space available for prolonged hospitalization and no provision for extended convalescence. In civilian practice most patients are allowed to resume their usual activities within 2 weeks after block excision and open packing whereas a soldier with an unhealed wound must be a hospital patient.

To supplement the published literature on this subject and to obtain the opinion of a group of proctologists whose work before the war included surgical experience in the management of pilonidal disease capable of serving as a basis of comparison with their own military observation, a questionnaire was addressed to 35 rectal surgeons who served in World War II. A brief expression was requested on

present opinion in regard to the open or closed type of procedure in civilian practice together with any preference for a special technique in either case. Nonmilitary conditions were specified in the questionnaire because of the different necessities of civilian and military practice with respect to the period of hospitalization and the return to duty.

Twenty seven answers were received and 21 of those who replied (77.7%) now regard the open type of operation as the best standard procedure under the conditions stipulated. Five (18.5%) believe that various closed procedures which were developed in military service will be routinely satisfactory in private practice. Some proctologists set up exacting criteria for the use of the closed procedure. Others who favor open procedures for the majority of cases have become convinced that under certain specified conditions the wound may well be closed at the time of operative intervention. A surprisingly large number of answers expressed satisfaction with the open procedure by which the lesion is marsupialized.

Fair consideration of the studies made by military surgeons indicates that there will be a place in civilian practice for marsupialization and for the reconstructive primary closure of pilonidal wounds when properly indicated and properly performed.

JOHN L. LINDQUIST, M.D.

Rietti, F.: Transitory Icteroascitic Syndrome following Sclerosant Treatment for Hemorrhoids (Sindrome ittero-ascitica transitoria inforta dopo cura sclerosante delle emorroidi). *Arch ital mal app dig* 1947 13 65.

A forty two year old male underwent treatment for external hemorrhoids, consisting of the injection of a 5 per cent solution of quinine hydrochloride and urea. Two weeks after the conclusion of treatment, the patient developed jaundice with claycolored stools and bile pigment in the urine. Although anorexia and asthenia were marked there was no elevation of temperature. The appearance of ascites led to paracentesis which showed a straw colored fluid without evidence of protein. Generalized pruritus was present and sinus bradycardia was noted by the consultant. The clinical picture subsequently improved and the patient appeared to have recovered.

The author supplies a cursory review of opinions on the icteroascitic syndrome and proposes three hypotheses: (1) there is no relation between the injection treatments and the liver disturbance; (2) there is a hypersensitive reaction to quinine which involves the liver; and (3) there is an establishment of a thrombophlebitic process proceeding from the inferior vena cava to the portal vein. The absence of laboratory studies makes a definitive diagnosis difficult, but the third theory is favored by the author.

Although recovery seemed to be complete the patient was to be watched for evidence of hepatic cirrhosis.

EDITH B. FARMWORTH, M.D.

LIVER, GALL BLADDER, PANCREAS, AND SPLEEN

Pettinari V.: Contributions to Hepatic Surgery (Contributi di chirurgia epatica) *Minerva med.*, T 1947 38 134.

Seven cases of surgery of the liver are reported.

The series comprises 2 instances of solitary adenoma, 2 of echinococcus cysts and 1 instance each of primary carcinoma involving excision of the entire left lobe, solitary cyst and melanotic tumor with secondary hemorrhage.

Resections of varying portions of the liver were done in all 7 cases with complete return to health in 5. Therefore it is stressed that hepatic surgery is not as formidable as is generally believed and that with good preparation and accurate surgical technique such interventions may be undertaken with out undue risk.

It is to be hoped that diagnostic means may be found by which certain lesions of the liver may be identified and given timely surgical treatment.

EDITH B. FARNWORTH M.D.

Brewer A. A.: Cholecystography A Comparative Study of Oral and Intravenous Contrast Substances. *Radiology* 947 48 269.

For the past 20 years cholecystography with tetraiodophenolphthalein was accepted as the best procedure for the examination of the gall bladder and the intravenous method was considered superior to the oral method.

The more recent introduction of priodax, however soon created the impression that this new dye is an excellent oral contrast medium having definite advantages over the tetraiodophenolphthalein. The author in the present study publishes the results of oral cholecystography with priodax in a series of 50 patients, 46 of whom were also subjected to intravenous cholecystography with sodium tetraiodophenolphthalein for the purpose of comparison.

A proper technique is essential. By the oral method, 6 priodax tablets of 0.6 mgm. are swallowed whole during the course of a fat free evening meal and the first roentgenogram is made the next morning (15 hours later) on an empty stomach. In the intravenous method, 3.5 mgm. of sodium tetraiodophenolphthalein, after being dissolved, properly filtered, and sterilized, is diluted in 500 c.c. of normal saline solution and injected slowly (in 45 minutes) to obviate too much reaction. Roentgenograms are made 4, 8, and 24 hours later.

In 104 patients the gall bladder appeared normal with the oral method of priodax. In 46 patients it appeared to be abnormal and therefore this group was re-examined with the intravenous sodium tetraiodophenolphthalein. In 39 instances the 2 examinations were in perfect accord, while in 7 there was definite disagreement.

In looking for the cause of disagreement the author found that all 7 patients had eaten no fat food or no food at all, prior to the examination. The priodax

given orally led to a faint shadow of the gall bladder indicating poor concentration of the dye but the intravenous method with sodium tetraiodophenolphthalein elicited fairly good to normal density of the gall bladder shadow. From this the author concludes that the gall bladder probably was full of thick concentrated bile which prevented the entrance of the fresh dye laden bile.

In 1935 Jenkinson recommended that all patients with nonvisualization of the gall bladder be placed on a diet rich in fats and re-examined after a month. It seems that such a procedure has a very definite advantage since it cleanses the gall bladder of the stagnating thick bile. Therefore one may assume that in the presence of a gall bladder with faint filling the accuracy of the diagnosis may be improved by repeating the examination with intravenous cholecystography preceded by a high fat diet.

T. LITVIN, M.D.

Calzolari T., and Dorfman, G. E.: Calcareous Cholelithiasis Stimulating a Porcelain Gall Bladder (Calcereas cholelithiasis stimulans una cholelithiasis porcellanea) *Polidolusica sex. chir.* 947 54 36.

A single case of biliary calculus is reported, in which the large calculus was of pure calcium carbonate while the lesser calculus was composed of a nucleus of cholesterol surrounded by calcium carbonate. Because of the unusual volume of the gall bladder the form suggested by the first type of stone, and the peculiar configuration of the second stone a false roentgenographic interpretation of total calcification of the wall of the gall bladder was made.

The largest stone was 50 mm. in length, 30 mm. in diameter and weighed 11.5 gm. while the smaller stone was 12 mm. in length 6 mm. in its greatest diameter and weighed 70 centigrams.

Calcium carbonate stones may be divided into two types (1) small stones which are of hard consistency and (2) larger stones which are less hard or even of soft consistency. The calcium may be derived from bile or exudate rich in calcium. While the pathogenesis is dependent on obstruction of the cystic duct stasis of bile and infection of the gall bladder the main factors responsible for the production of any one specific type of stone are (1) the special degree of virulence of the bacteria, and (2) the special infection of the gall bladder.

ANTHONY F. CIRIO, M.D.

Hultborn, E. A.: On Spontaneous Complete Discharge of Stones from the Gall Bladder and Common Duct. *Acta chir. scand.* 947 95 260.

The author describes 3 unusual cases in which stones in the gall bladder and bile ducts were believed to have passed spontaneously.

The first case was that of a young woman who had 5 typical attacks of gallstone colic. Cholecystography established the presence of a large number of pepper corn sized nonroentgenopaque stones present in the gall bladder. At operation 2 months after the last examination no concretions could be detected.

Two additional cases were presented in which intestinal cholecystography revealed several small stones that subsequently disappeared upon repeated x ray examinations. In all 3 cases the stones were of a very small size.

In view of the possibility that gallstones if they are sufficiently small may pass into the duodenum spontaneously the writer suggests that it may be advisable to use choleretics cholecytokinetics and spasmolytics to improve the prospect for the spontaneous passage of concretions. Bile salts stimulate bile secretion, and olive oil and egg yolk produce the sphincter of Oddi and small doses of magnesium sulfate favor the evacuation of the gall bladder. If spontaneous passage of small gallstones may evidently occur then repeated cholecystography is advisable if some time has elapsed between the x ray examination and the intended operation.

The author considers it quite unlikely that the unusual disappearance of gallstones is the result of their spontaneous dissolution. He prefers to believe that small stones may pass by natural processes from the gall bladder through the biliary ducts into the duodenum.

Edward F. Lewison M.D.
 Gaertner E.J. Cystic Dilatation of the Common Duct. *Endocholedochorrhaphy. Cure (Dilatation of the ducts do colédoque endocholedochorrhaphy. Cure)*
Rev. Brasil Cir. 1947 16 65

A cystic dilatation of the common duct was observed by the author in a 14 year old boy with complaints of a year's duration. A tumor in the right upper quadrant of the abdomen was changing its size from time to time. Frequent attacks of nausea and vomiting were recorded in the history. The percussion sound over the tumor was sonorous.

A tentative diagnosis of cyst of the liver or the mesentery was made but the exploration revealed a large retroperitoneal fluctuating tumor. The abdomen was closed on the assumption that a gigantic right hydronephrosis was present. Excretory urograms did not confirm the diagnosis and the patient was again operated upon 5 months after the first intervention. A cyst of the common duct containing 1500 c.c. of bile was found. A probe introduced through the lumen of the cyst reached the duodenum. The posterolateral approach employed for the operation would offer technical difficulties to cholecystectomy and therefore the author chose a method of reconstruction of fusiform aneurysms. The postoperative course was uneventful and was not complicated by vomiting or any other digestive disturbance.

The etiology of a cystic dilatation of the common duct remains obscure but several factors may be considered viz congenital malformation trauma or compression by a pregnant uterus, adenoma of the pancreas, and tuberculous infiltration of the mesentery. A cystic dilatation of the duct should not be confused with a diffuse dilatation of the duct which

follows an obstruction by a gallstone dystony of the sphincter or compression by a tumor. The condition may become complicated by an infection of the biliary system.

Tumefaction and pains are the main symptoms while jaundice is rare. As to the treatment external drainage or marsupialization should be avoided. Endocholedochorrhaphy is preferable to cholecystoduodenostomy because it preserves a normally functioning gall bladder.

Cole W.H. Suppurative Cholangitis. *Surg. Clin. N. America* 1947 37 35

In most cases suppurative cholangitis probably starts in the extrahepatic bile ducts and tends to proceed upward into the liver particularly if there is obstruction to the flow of bile. It rarely occurs when there is no obstruction. The most common bacteria producing the infection are the *Escherichia coli* the *Streptococcus* and the *Staphylococcus*. The infection is usually of a mixed type although cultures taken at various intervals may not reveal all three of these bacteria at the same time.

Stone in the common duct is the most common type of obstruction giving rise to suppurative cholangitis and is the one type which may clear spontaneously because of the ball valve action of the stone. The obstruction due to stone is not as complete and persistent as most other obstructions. Carcinoma of the pancreas is not recognized as being a common cause of suppurative cholangitis but the author has seen several cases in which this lesion was the etiologic factor. Stricture of the common duct almost always gives rise to suppurative cholangitis sooner or later. Usually stricture is secondary to trauma sustained at operation on the biliary tract. In a few instances it appears that there is an unusual type of inflammatory reaction which might be designated as obliterative cholangitis which can produce serious obstruction. It is possible that on some occasions an abscess may develop postoperatively about the duct thus giving rise to inflammation in the wall. Congenital cystic dilatation of the common duct may give rise to suppurative cholangitis but not frequently because no antecedent infection exists. Regurgitation of the intestinal contents into the common duct or intrahepatic bile ducts can give rise to suppurative cholangitis. Infection will develop much more commonly in the presence of regurgitation if there is partial obstruction, although the author describes 3 cases in which suppurative cholangitis was produced by regurgitation in the absence of duct obstruction. Suppurative cholangitis is much less likely to develop if there is an appreciable amount of common duct although proof in the liver and the source of regurgitation in the intestine. The initial source of the infection is probably in the wall of the common duct although proof in the section may more readily be obtained from the presence of purulent material in the lumen of the common duct. Ascending infection through the sphincter

ter of Oddi up the common duct can be excluded as a significant factor in the development of infection. After infection once develops in the wall of the common duct it tends to spread to the contents of the lumen and to progress upward into the liver particularly if there is obstruction to the flow of bile. The wall of the common duct becomes thickened, edematous, and fibrosed. When the infection extends into the liver there is a tendency for the development of multiple liver abscesses. The contents of the common bile duct may or may not be frankly purulent. The presence of white bile indicates obstruction but in itself no indication of the presence of infection. The bile retains a rather transparent glairy appearance until it is infected after infection develops it becomes opaque, loses its opalescent appearance, and becomes thicker.

The clinical manifestations are

1. Chills and fever. The chills vary greatly in frequency and fever without chills is frequently present.

2. Jaundice and acholic stools. Since obstruction is usually present jaundice is fairly constant. Jaundice may not be demonstrable at the time of the first symptoms of chills and fever. The stool may be acholic before jaundice is demonstrable in the skin. If the stool has a normal color it may suggest that the obstruction is only partial or that it is intermittent.

3. Pain. The presence or absence of pain depends on the type of lesion producing the obstruction or infection. With very few exceptions the patient will complain of pain if the infection is secondary to stone in the common duct. If the infection is produced by stricture, pain is variable and, although usually present it is usually of less intensity. When the condition is caused by carcinoma of the head of the pancreas, pain is not commonly encountered.

4. Nausea and vomiting. During the attacks of chills and fever these symptoms are common, but they are uncommon between attacks.

5. Weakness and prostration. During the acute attack weakness is pronounced. If jaundice and fever persist beyond the acute attack, weakness will be still more pronounced.

6. Positive physical findings. Enlargement of the liver and mild tenderness in the right upper quadrant are present in the majority of cases but muscle spasm is uncommon. The diaphragm may be elevated on the right. Tachycardia is fairly pronounced the degree being dependent on the amount of fever.

7. The most pronounced positive laboratory finding is leucocytosis, usually of marked degree. Anemia is common. Examination of the urine and stool for bile is usually positive and negative respectively.

Surgical drainage of the common duct is essential in the treatment of suppurative cholangitis. Penicillin cannot be relied on as the sole form of treatment, although it should be given and continued for several days after drainage is established. Streptomycin will probably prove to be much more effective than penicillin. If culture of the bile obtained by choledochos-

tomy reveals the *Escherichia coli*, streptomycin is indicated in preference to penicillin. Sulfonamides are helpful but not as effective as these two drugs. Preoperative and postoperative care is stressed, and particular attention should be given to fluid and electrolyte imbalance and anemia. Drainage of the common duct with a T-tube is necessary and attempts should be made to correct the obstruction, particularly if it is due to a stone in the common duct. If the patient is extremely sick, confirmation of patency of the lower end of the common duct by time consuming manipulations will not usually be necessary or justifiable. If an obstruction is present it can be corrected later.

Five cases of suppurative cholangitis due to various causes are described. Because regurgitation of food through the choledochointerostomy opening occurs following anastomosis of a loop of jejunum to the hilar duct, the author no longer employs this procedure but uses a single arm of jejunum for the anastomosis, after the principle of Roux.

JOHN L. LINDGREN, M.D.

MISCELLANEOUS

Thorek, P. The 6 Subphrenic Spaces. *Surgery*, 1947, 73:9.

If subphrenic disease be kept in mind, especially as a complication of intra-abdominal suppurative processes, it can be diagnosed earlier and treated more effectively.

The subphrenic space is that which exists between the diaphragm above and the transverse colon and its mesocolon below. This area is divided by the E into suprahepatic and infrahepatic portions. The suprahepatic part is bounded above by the diaphragm and below by the upper surface of the liver. The infrahepatic part is bounded above by the under surface of the liver and below by the transverse colon and its mesocolon. Three suprahepatic and three infrahepatic spaces exist. The falciform ligament divides the suprahepatic area into right and left parts. The superior surface of the right lobe of the liver resembles an inverted cup or bowl, so that this surface appears both anteriorly and posteriorly. The cut section of the left lobe however resembles a chip so that the dome shaped anterior and posterior relations of the superior surface are wanting. On the right side, the right lateral ligament which is a prolongation of the coronary ligament, divides this area into two spaces, a large anterior and a small posterior one. These ligaments are peritoneal reflections. The left lateral ligament passes along the posterior border of the left lobe of the liver and separates the superior from the inferior surface. Therefore only one space exists to the left of the falciform ligament. The three suprahepatic spaces then constructed are named in the following way: space 1 which exists above the liver anterior to the right lateral ligament and 2 the right of the falciform ligament and is also called the right superior anterior subphrenic space; space 3 which is located to the right of the falciform ligament, takes in the

superior surface of the liver and is behind the right lateral ligament and is also called the right superior posterior subphrenic space and space 3 which is situated between the liver and the left half of the diaphragm, and is also known as the left superior subphrenic space. The infrahepatic area is divided into right and left parts by the descending portion of the duodenum although some anatomists use the ductus venosus for this division. The right inferior subphrenic space is located to the right of the duodenum and below the liver and is the same as the hepatorenocolic pouch of Morrison. The left side of the infrahepatic space is divided by the stomach into anterior and posterior parts. This creates a space which exists to the left of the duodenum and in front of the stomach and hence is named the left inferior anterior subphrenic space. This also has been referred to as the perigastric space. The final or sixth space is situated to the left of the duodenum, below the liver but behind the stomach. It is known as the left inferior posterior space or the lesser peritoneal cavity (omental bursa). All of the spaces are intra-peritoneal.

The space most frequently involved is the one which is the smallest and most difficult to reach namely the right superior posterior. This is due to the fact that the most frequent causes of subphrenic infection are on the right side namely acute appendicitis, acute cholecystitis, and perforated peptic ulcer. An inflammatory exudate from any of these three lesions may travel upward along the so-called paracolic groove of the ascending colon and localize in this space which is the most difficult to reach surgically and causes the most difficulty in diagnosis.

The diagnosis of subphrenic abscess can usually be made if the condition is kept in mind. The inaccessibility of the subphrenic region also accounts for the delay in diagnosis but there are many signs and symptoms which will suggest the possibility of this lesion. The onset may be abrupt or insidious, but the one outstanding finding is continuous fever. An unexplained fever which persists following a suppurative intraperitoneal process should at least suggest subphrenic abscess. The patient complains of pain or a sense of pressure in the upper abdomen or loin which is usually aggravated by deep inspiration and thus may be confused with pleurisy or pneumonia. If an infection is present in the right posterior superior space, the pain may be referred to the lumbar region however the cases which involve the right anterior superior space or right inferior space usually have pain which is referred to the right costal margin.

Localized tenderness which is found over the involved region is of greatest diagnostic importance however its absence does not rule out subphrenic pathology. If an abscess is present in the right posterior superior space the tenderness localizes over the right twelfth rib. By the same token local tenderness is found along the costal margin on the respective sides. In abscesses in the right anterior superior the right inferior the left superior and the left anterior inferior spaces. The liver is displaced down

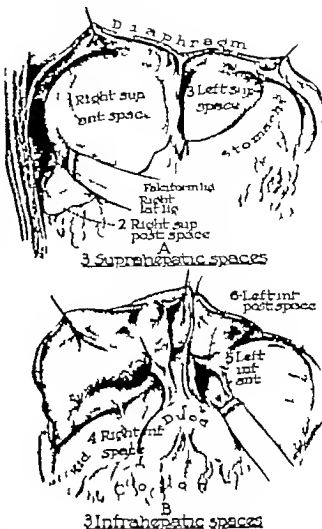


Fig. 1 (Thorek) a. The three suprahepatic spaces. The suprahepatic region is divided by the falciform ligament into right and left parts. Space No. 1 is situated to the right of the falciform ligament, above the liver and anterior to the right lateral ligament. It is therefore called the right superior anterior space. Space No. 2 is located to the right of the falciform ligament, above the liver and behind the right lateral ligament. It is called the right superior posterior space. Spaces Nos. 1 and 2 are separated from each other posteriorly by the bare area of the liver. Space No. 3 is found to the left of the falciform ligament and, since the left lateral ligament passes posteriorly along the flattened left lobe of the liver, there is only one space on this side in contrast to the two on the right. It is called the left superior space. b. The three infrahepatic spaces. The infrahepatic region is divided by the descending duodenum into right and left parts. For convenience these spaces have been numbered 4, 5, and 6. Space No. 4 is to the right of the duodenum, and below the liver. It is therefore called the right inferior space. This is the same as the hepatorenocolic pouch of Morrison. Space No. 5 is found to the left of the duodenum, below the liver and in front of the stomach. It is called the left inferior anterior space. Space No. 6 is located to the left of the duodenum, below the liver and behind the stomach. It is called the left inferior posterior space or lesser peritoneal cavity. The arrow indicates its position and surgical approach.

ward and an area of increased liver dullness to percussion will be found in abscesses of the right anterior superior the right posterior superior and the left superior spaces.

Roentgenography is of great help if one emphasizes the importance of the fluoroscope instead of the x ray plate. Although it is true that the diaphragm is elevated in subphrenic abscess, this in itself is not pathognomonic. On the other hand immobility of the hemidiaphragm on the involved side is most suggestive of subphrenic pathology this sign is of utmost importance and is most essential to the diagnosis. The presence of gas represents a late finding hence a neglected case however its absence denoting a more favorable condition, does not eliminate the diagnosis of subphrenic abscess.

The use of aspiration for diagnosis is feared because of the danger of contaminating the pleural or peritoneal cavities.

Treatment is dependent upon the location of the infection and the presence or absence of suppuration. Since the majority of subphrenic infections do not go on to suppuration they may be treated by conservative measures, especially by modern chemotherapy

If the white blood count rises above 20,000, it is most suggestive of a suppurative process which will necessitate surgical intervention and drainage. It is of utmost importance to avoid contamination of uninvolved cavities in the drainage of such an abscess. This is imperative when the pleural and peritoneal cavities are concerned since the marked absorptibility of serous membranes might produce an immediate overwhelming toxemia. The ideal procedure, surgical approach is an extraperitoneal one in which the abscess is approached either from in front or from behind, according to the location of the abscess. Since the right superior posterior space is the one most frequently involved a retroperitoneal operation is usually performed. The only point which bears emphasis is based upon the work of Medakoff who showed the variations and the relation of the costophrenic angle to the twelfth rib. This point is that the skin incision is made along the course of the twelfth rib but the incision through the rib bed should change its course to a transverse one. The latter is made at the level of the spinous process of the first lumbar vertebra to avoid contamination of the pleural cavity.

BENJAMIN GOLDBACK, M.D.

GYNECOLOGY

UTERUS

De Queiroz, A.P. Review of 540 Cases of Genital Prolapse Observed at the Gynecologic Clinic of the Bahia School of Medicine Since Its Creation until the Present Times 1911-1946 (Revisão de 540 casos de prolapso genital observados na Clínica Ginecológica da Faculdade de Medicina da Bahia desde a sua criação Até hoje 1911-1946) *Am. brasíl. gín.* 1946 11: 435

During the 35 year period from 1911 to 1946 540 patients, or 10.5 per cent of the entire material (5143 patients) observed at the Gynecologic Clinic of the Bahia School of Medicine, presented genital prolapse. Sixty per cent had complete procidentia and 40 per cent, partial prolapse or so-called descensus. The incidence of the colored patients, the greatest being that among the colored patients, between 30 and 40 years of age. In 24 cases a concomitant lymphopadnia venerea was present. Among the 540 patients 10 were virgins and 19 were nulliparas. The condition occurred with the greatest frequency in multiparas with two pregnancies.

Of the great variety of operative procedures the author favors Ponsi's hysterocoelectomy and Bouill's operation or the colpoepineal plastic operation with cervical amputation. JOSEPH K. NAKAT, M.D.

Boveas J. L. Functional Surgery in Uterine Myomas (La cirugía funcional en el mioma uterino) *Rev. méd. Rosario* 1946 39: 784 1947 37: 39.

In the gynecologic section of the author's hospital up to the present there have been 1453 surgical interventions on the uterus. In this material there were 358 postoperative complications. These included 100 (74.1 per cent) in 147 total hysterectomies, 100 (11.1 per cent) in 893 subtotal hysterectomies and 68 (78.4 per cent) in 88 vaginal hysterectomies. The complications included 31 cases of bronchopneumonia (3 in the myomectomies), 13 parotitis (15 of operative shock (15 with fever of unknown origin and 4 in the cardiac collapse (3 cases of paralytic ileus, 11 cases of acidosis and among the myomectomies), 11 cases of peripheral collapse, 6 of cardiac insufficiency, 13 of acidosis and the remainder a variety of complications of lesser importance. The general mortality for this material is not discussed other than to mention that the mortality on the whole corresponded in incidence to the complications. Among the myomectomies there were 4 deaths. One of these deaths was the result of bronchopneumonia, 1 of cardiovascular collapse, 1 of embolism and 1 of pneumonia. The results obtained in these myomectomies are not discussed in detail since they have been reported by the author's associate, Bórras, in numerous articles. The author merely states in a general way that the immediate results in these patients have

been satisfactory both from the psychic and physical aspects. The menstrual flow during the first 6 months following the operation has been rather abundant lasting from 6 to 8 days but amenable on the whole to the usual methods of therapeutics. Of the 213 myomectomized women in the last 6 years the 213 have become pregnant. Of these 2 had previously been sterile, and some of them had been married but without children for as long as 14 years. Ten of these 15 patients delivered normally, 2 were delivered by cesarean operation. In these 2 there had not been any sign of a tendency toward labor which led to the suspicion that the uterus had lost the proper disposition of its nerves and muscular structure for the initiation of labor. Three of the myomectomies were carried out during pregnancy and the 2 others terminated in spontaneous abortion and the 2 others went on to normal delivery.

The author believes that part of their excellent results are to be ascribed to Bórras' method of pre-cautionary hemostasis which is illustrated in the original article.

The myometrectomy of Cino which was described by Cino himself 3 years ago (*Obst. gín. lat. amer. B. Ar.* 1945 3: 761) and abstracted in the INTERNATIONAL ABSTRACTS of SURGERY (1946 83: 52) is also illustrated but no mention is made of any experience therewith. JOHN W. BROWN, M.D.

Heyman J. The Radiotherapeutic Treatment of Cancer Corporis Uteri. *Brit. J. Radiol.* 1947 30: 85

Of 100 cases of cancer of the uterus referred to the Radiumhemmet for treatment, between 20 to 25 are cancer of the corpus. Hysterectomy is definitely not applicable to 80 per cent of the cases. It is true that the great majority of corpus cancers are bad as far as the anatomic extent of the growth is concerned. However many of these cases are bad operative risks because of old age, adiposity, heart conditions and similar complicating diseases. Of 670 cases observed during the period from 1914 to 1939, inclusive, but clinically inoperable cases, 1039, operative but clinically inoperable cases amounted to more than 50 per cent of the total.

The 5 year cure rate obtained by hysterectomy in cancer of the corpus is difficult to estimate. The relative 5 year cure rate in 4 reports involving series of five 5 year cure rate in 4 reports involving series of 100 or more varies between 48 and 55 per cent. At the Radiumhemmet a combined operative and radiotherapeutic treatment has been adopted in this treatment radiotherapy plays the primary and most important part. Since 1930 a radiotherapeutic technique which is now used as a routine in the treatment of corpus cancer has gradually been elaborated. It involves packing the uterus with a sufficient number of radium containers to get the uterine cavity completely filled.

In packing, either tubes containing 8 mgm. of radium element or needles containing 10 mgm. of radium element, the filter of the wall being equivalent to 1 mm. of lead are used. Each tube or needle is placed in an additional filter the size of which varies according to the width of the uterine cavity small filters being applied to small cavities and large filters to large cavities. Additional filters of 6 different sizes each with a wall thickness equivalent to 3 mm. of lead, are used. The variation of the diameter of the additional filter is achieved by varying the air space between its external and internal wall. The irradiator ready for use consists of the tube the additional filter and a screw plug which fits all the filters and to which is attached the tube holder for insertion of the tube. For introducing the irradiators into the uterus a special applicator is used. One end of the applicator fits the screw plug at the other end is a wedge and a clamping plate for securing the string during introduction. The technical skill required for application is not difficult to acquire. Accidents have been rare. In the total series of cases, at present amounting to about 1000, serious accidents have occurred 3 times all of them were due to perforation of the uterus. The irradiators are removed by the nurse and generally without any difficulty.

In most cases of corpus cancer at the Radium hemimet radiotherapy is the primary therapeutic interference. Two treatments are given with an interval of 3 weeks. In of the treatments radium is also applied to the vagina in order to prevent vaginal metastases. Roentgen treatment is administered in such cases only when fixation of the uterus indicates that the growth has spread to adjacent organs.

Surgical interference is resorted to in case of failure of radiotherapy which is indicated usually by repeated bleeding or increase in size of the uterus. There is no difficulty in removing the uterus after a properly conducted radium treatment. Even a subtotal hysterectomy will suffice in many of the recurrent cases and may be helpful in cases difficult to operate upon for one reason or another. Surgery may occasionally be resorted to as a primary interference, for instance in cases of corpus cancer combined with large fibroids.

The irradiators remain in the uterus for a varying length of time, according to the amount of radium applied and to the type of irradiator used. On the

basis of previous empirical experience the dose of 1500 element hours, given twice at 3 week intervals has been adopted as the most suitable one when 10 irradiators each containing a tube of 8 mgm of radium element and with an additional filter of medium size are used.

At each treatment the patient remains for 4 or 5 days in the hospital.

The results are given in Table 1:

For the 205 patients treated in the period from 1934 to 1939, the relative cure rate is 64.9%.

The results in different groups were as follows: clinically operable, 67 per cent, 5 year cures technically operable 48 per cent cures and inoperable, 28.7 per cent cures. DUMAS, G. MORRIS, M.D.

Lipin T., and Davison, G.: Metastases of Uterine Carcinoma to the Central Nervous System: A Clinicopathologic Study. *Arch. New York*, Phila. 947 57 86.

The author notes that metastases of carcinoma of the uterus to the central nervous system are infrequent. These metastases are often solitary and may occur in the absence of widespread disease. In cases of a single metastatic nodule in the brain without evidence of carcinomatosis, the advisability of neurosurgical intervention should be considered, for in selected cases life may be prolonged appreciably by operation.

Three cases of metastatic brain tumor from uterine cancer are reported in detail in all of which the primary growth was adenocarcinoma of the fundus. In addition 3 cases of metastatic tumor of the brain from carcinoma of the uterus are summarized from the literature because they illustrate important points. The first case presented by the author illustrates that carcinoma of the uterus may give rise to a solitary metastasis to the brain in the absence of metastases to other organs. The second case reveals that evidence of carcinomatosis appeared 5 years after the patient had a hysterectomy for a uterine adenocarcinoma. Although there were multiple metastases to many organs, only a single metastatic nodule was observed in the brain. In the third case a single metastasis to the central nervous system occurred in a patient with carcinomatosis secondary to a malignant growth in the uterine fundus.

In a discussion of therapy the author notes that neurosurgical intervention is contraindicated in most cases of metastatic tumor of the brain secondary to uterine carcinoma because of the frequent accompaniment of carcinomatosis but when there is not evidence of this complication and when signs suggest a solitary brain tumor neurosurgical intervention may prolong life.

In conclusion the author notes that metastases from carcinoma of the uterus probably account for 1 to 3 per cent of all carcinomas of the central nervous system. The percentage of uterine carcinomas metastasizing to the central nervous system varies from 0.1 to 3.4 per cent according to different sources.

TABLE 1—THE 5 YEAR RESULTS IN CASES TREATED FROM 1914 TO 1939 INCLUSIVE

Total number of patients examined	698
No. of patients alive without evidence of the disease	363
Absolute cure rate	52.0%
Number of patients treated	670
No. of patients alive without evidence of the disease	363
Relative cure rate	54.0%

Carcinoma of the breast, lung, pharynx, sinuses, thyroid, and adrenal glands may metastasize more frequently to the central nervous system than carcinoma of the uterus, whereas carcinoma of the stomach, urinary bladder, pancreas, and esophagus may metastasize less frequently. There is evidence that metastases to the central nervous system from uterine carcinoma are often solitary.

Uterine carcinoma may metastasize to the central nervous system in the absence of carcinomatosis. In cases in which metastasis to the central nervous system from a carcinoma of the uterus is suspected, neurosurgical exploration is indicated only if there is no evidence of multiple metastases to the brain or spinal cord and no evidence of carcinomatosis.

HERBERT F. THURSTON, M.D.

Ahlborg G. On Conservative Myomectomy. *Acta Obst. Gyn. Scand.* 1946 16 Supp. 6

The author presents an exhaustive study on the subject of myomectomy; the first 78 pages of which are devoted to a survey of the literature. He has felt justified in subjecting the views expressed in these monographs to a detailed and rigid scrutiny, since he believes, from previous studies, that no conclusive proof of the relative advantages and disadvantages of myomectomy has so far been adduced. Statistics in Sweden for the years 1925, 1930, 1935, and 1940 reveal an increase in the relative frequency of myomectomy in the special clinics and operations of this kind were commoner in the special clinics than in the local hospitals.

A detailed description is given of the method of enucleation employed. At the conclusion of the operation it is customary to insure ventral fixation of the uterus seroserosally against the anterior abdominal wall. In the author's series, 18 of the patients who had undergone ventral fixation later became gravid. In 14 instances pregnancy proceeded to term; miscarriages occurred in 4 cases.

The author's material comprises 382 abdominal myomectomies and 46 vaginal myomectomies and 92 per cent of the patients were operated upon by the same surgeon.

Multiple fibroids occurred in 69 per cent of the patients. In the majority of cases solitary fibroids were treated by enucleation, while multiple fibroids were treated by radical operation. The greatest number of tumors removed in a single case was 30. Solitary fibroids were commoner in patients who had previously undergone a pregnancy, while multiple fibroids were found more frequently in sterile patients.

The majority of patients treated by enucleation were young; the reverse was true of those who were treated by radical operation. Menorrhagia, pains, and sterility, in the order named, were the most frequent indications for operation. The sizes of the enucleated fibroids varied within wide limits. There seemed to be no relation between the size and the number of fibroids, between the size of the fibroids and a preceding pregnancy, the size of the fibroids

and the age of the patient at operation, nor between the size of such tumors and their position in the uterus.

Necrosis occurred in 20 per cent of the cases and was more common among gravid patients. This did not constitute a contraindication to enucleation. The sedimentation reaction provided no certain clue as to the presence of necrosis.

Adenomyomas occurred in 5 per cent of the patients treated by enucleation. Not a single instance of sarcoma was discovered among the patients in whom abdominal myomectomy was performed. In 3 cases cellular leiomyomas were diagnosed. A diagnosis of sarcoma was made in 1 of the 46 cases in which vaginal myomectomy was performed. Of the 573 patients who had undergone radical operation for fibroids, a postoperative diagnosis of sarcoma was made in 2 cases. If all cases are included, the incidence of sarcoma in 902 cases of fibroids is 0.55 per cent. In not one of the cases in which enucleation was considered was it necessary to abandon this method of treatment because of coexistent cancer in the uterus, although cancer was found in 1 case in which radical operation had been performed.

Although the uterine cavity was usually left unopened during enucleation, it was explored in 16 per cent of the cases. It is believed that exploration of the uterine cavity may be justified in certain cases.

Excision of the myoma capsule in myomectomy was carried out only in exceptional cases.

Changes in the adnexa or pelvic peritoneum were registered in 48 per cent of the 382 cases in which enucleation was accomplished, and in 46 per cent of the cases in which radical operation was carried out. It is not rational to limit enucleation strictly to those cases in which the appendages are completely normal.

Complications during enucleation arose in only 3.5 per cent of the cases. The most common complication was hemorrhage during and after enucleation. All patients recovered. Variations of temperature after myomectomy were on the average moderate.

Postoperative involution appeared to be complete after a period of a few months and the uterus was eventually restored to its normal size and shape.

Not a single postoperative death is recorded among the 382 patients subjected to abdominal myomectomy. One reason for this may be that patients subjected to enucleation are usually good subjects for the operation. The death rate attending 573 radical operations was 2 per cent. Any direct comparison between the death rate in the two groups must be misleading, since the radical operation is applicable to older age groups and to more complicated cases than those found in the conservative group.

Two hundred and fifty-five patients (90%) who underwent enucleation showed a postoperative sequence free from all complications. Serious complications arose in only 3 per cent of the cases. Complications associated with healing are believed to be somewhat more common after radical operation than after abdominal myomectomy. The postoperative

sequence does not appear to be unfavorably influenced by the enucleation of necrotic or large fibroids, by exploration of the uterine cavity in the course of enucleation, nor by chronic inflammation of the tubes, and abdominal wound healing is better than that following radical surgery.

Enucleation was performed during pregnancy in 14 cases—before term in 11 patients and in conjunction with cesarean section at term in 3. Of the 11 cases, 6 pregnancies were maintained and 5 were arrested. Partial myomectomies were performed in 8 patients, 7 of whom were pregnant.

Of the 185 patients subjected to enucleation, 15 per cent desired treatment for sterility; however sterility did not constitute the main indication for operation.

A variety of factors determine the suitability or otherwise, of conservative treatment in a given case of fibroids: the age of the patient, the number of fibroids, and their location in the uterus, the delimitation of the tumor from the surrounding myometrium, the condition of the ovaries and tubes, together with the patient's case history and individual preferences in the matter of a radical or conservative procedure. In many instances the final choice cannot be made until the operation is actually in progress.

As a result of re-examination of the patients it was found that of 161 women who had undergone enucleation 75 per cent were free from recurrence; 167 patients (88%) were found to be symptomless and 47 patients complained of various disabilities, the commonest being menorrhagia and dysmenorrhea. The symptoms were alike both in patients with recurrence and in those free from recurrence.

While enucleation sometimes results in a reduction of the quantity and duration of the menstrual flow some patients find that their menorrhagia is unaffected by enucleation and in these it is believed that myomectomy might well be supplemented by curettage of the uterine mucous membrane. About three fourths of the women subjected to myomectomy were found to be free from menstrual pains after operation.

Of the 93 patients subjected to enucleation, who were in condition to conceive after operation, 31 per cent became pregnant. The mothers in question gave birth to 36 living infants and 1 stillborn infant. On the whole these pregnancies followed a normal course. Spontaneous deliveries occurred in 29 of 36 patients. In 5 cases forceps were applied and in 1 case cesarean section was performed. The majority of these patients were old primiparas. All of the mothers survived delivery.

There is no substantial evidence to suggest that pregnancy and labor are especially influenced by the number of fibroids shelled out by their size or by the opening of the uterine cavity in the course of enucleation. The interval between enucleation and conception is often remarkably short. Of 31 intrauterine first pregnancies occurring after enucleation 23 (74%) proceeded to term.

Certain cases of pregnancy helped to clarify the possible influence of uterine fibroids on sterility. In 5 of the patients sterility had persisted for a period of from 3 to 15 years, and these patients became pregnant within a year of the operation. Here, in all probability sterility was cured as a result of myomectomy. Pregnancy developed later in 3 of the 8 patients in whom a salpingostomy had been performed. In only a single instance did pregnancy develop following vaginal myomectomy.

T. FLORIN BRIL, M.D.

ADRENAL AND PERIUTERINE CONDITIONS

Guillemin G. and Mousselon, J.: *Étiologique Investigation into Adrenal Tuberculosis during the War Years. Clinical and Therapeutic Deductions Concerning 80 Recent Observations* (Enquête étiologique sur la tuberculose adrénaïque pendant les années de guerre, déductions cliniques et thérapeutiques. A propos de 80 observations récentes). *Lyon chir.* 947 48 79.

During recent years the authors have noted as alarming increase in adrenal tuberculosis. They attribute this increase to hard living conditions, physical strain and added responsibilities placed upon women as a result of the war and its consequences.

Formerly tuberculosis in the adrenals was a rarity few cases being encountered from year to year. During the 7 year period from 1925 to 1932, inclusive, only 30 cases were observed in the hospital and private clinic of Cotte but during the 6 year period from 1930 to 1935, inclusive, 80 cases were treated in the hospital and 30 cases in the private clinic of Cotte, a total of 110 cases. The condition quadrupled itself in the last named period.

In all of the 80 cases the tuberculous nature of the lesion was proved. In 44 cases there was positive anatomopathologic proof. In 3 cases there was positive bacteriologic proof, the bacillus of Koch being identified in the pus from the lesion or by guinea pig inoculation. In 33 cases, antecedent tuberculosis lesions in other parts of the body and verification of tuberculosis at the time of surgical intervention afforded sufficient proof so that anatomopathologic and bacteriologic proof was superfluous.

Adrenal tuberculosis was found to occur most often in young women. Of the 80 patients, 6 were less than 30 years, 40 were between 30 and 39 years, 21 between 40 and 49 years, and 6 were more than 50 years of age.

A majority of the patients had shown evidence of tuberculosis in other parts of the body before they developed trouble in the adrenals. Twenty-one of the 80 (26%) had shown pleuropulmonary tuberculosis, 3 had had tuberculosis of the pulmonary parenchyma and the remainder had had cervical adenitis or renal tuberculosis.

The disease was found most often in young married women especially those who had borne children. Cases of adrenal tuberculosis are presented by the authors to show that married life and childbirth

played an important part in producing acute adnexitis in young women who had either arrested or latent tuberculosis in other parts of the body.

Married women complaining of sterility showed evidence of an old pleurisy and an apparent secondarily genital tuberculosis responsible for the condition from which they sought relief.

From the clinical viewpoint the symptoms of which the patients complained were varied. Of the 80 patients treated 18 with acute conditions presented signs of antecedent tuberculosis. In 5 the pain and generalized symptoms were severe on account of the presence of a large abscess in the pouch of Douglas and immediate colpotomy with drainage of the abscess was necessary. Examination of the pus thus obtained afforded the demonstration of Koch's bacillus to clinch the diagnosis of tuberculosis of the adnexa.

The 62 chronic cases presented such symptoms as lumbar or pelvic pain without fever (22 cases) dysmenorrhea (15 cases) menstrual irregularities (10 cases) sterility (16 cases) and postoperative appendectomy fistula (1 case). Pain at the menstrual period or pain between the periods was the most constant symptom. The pain had been present over a long period of time, originating in the lower abdomen and radiating to the lumbar and crural regions. Of ten the pain was mistaken for that originating from an acute appendicitis and only when appendectomy was performed was the true nature of the disease recognized.

For the most part the menstrual disorders complained of were metrorrhagia of ovarian origin, varying in intensity. One patient had been amenorrheic for 6 months when the acute symptoms occurred.

Sterility, which resulted from coarctation of the pelvic organs, was usually asymptomatic. Latent tuberculosis was found in these cases.

One patient, 19 years old, married and without antecedent tuberculosis, sought relief from a right iliac fistula following an operation for acute appendicitis, performed 6 months before entry into the hospital. At the time of the operation a large right iliac abscess, an abscess of the right ovary and bilateral pyosalpinx were found.

In general the surgical treatment of these cases was as conservative as possible. All interventions were carried out through an abdominal incision.

Eighteen cases were operated for the relief of acute adnexitis and pelviperitonitis, the bacteriological nature of the disease not being recognized prior to operation. In 2 cases simple laparotomy was done, in 3 cases unilateral castration was done, in 2 cases bilateral castration was done, in 7 cases the uterus with one or both ovaries was preserved, in 2 cases subtotal hysterectomy was done and in 1 case total hysterectomy was done. Of the 18 patients 4 died soon after the operation, while 2 died some months after the operation, a mortality of 30 per cent.

On the basis of their experience the authors advise that in such acute cases surgical intervention

should be delayed and expectant treatment, heliotherapy and improved living conditions until the patients' general condition has improved sufficiently to undergo operative treatment are indicated.

In chronic cases the surgical risk is not so great. Conservative surgery and avoidance of useless mutilations eliminate the disturbing physical and psychological sequelae attendant upon castration. In cases of unilateral involvement, which are rare (only 4 of the 62 chronic cases were unilateral), the chances for obtaining good results are more favorable. The operations performed on these 62 chronic cases were simple laparotomy (16) unilateral castration (4) bilateral castration (2) conservation of the uterus and of one or both ovaries (35) total hysterectomy (1) and repair of the cornua (4). At the time of surgical intervention 20 resections of the presacral nerves and 20 appendectomies were done. These operations were done to eliminate postoperative dysmenorrhea and discomforts due to chronic appendicitis. In other cases peritonization with freeing of the vesical peritoneum was performed; this had the double advantage of fixing the uterus in good position, thereby preventing secondary retroversion and promoting as complete peritonization as possible to cover the raw surfaces of the pelvis.

In the majority of the cases, there was a postoperative gain in weight, disappearance of fever and in cases in which the uterus was retained a more normal menstruation.

Fifty-two of the 80 cases operated were followed up later. One patient in whom the presacral nerves were not resected complained of dysmenorrhea. Two patients remained amenorrheic in spite of the conservative operation.

There were no deaths among the chronic cases. The immediate postoperative results were so good that in some cases the authors regretted not having done a more radical operation.

BLACKWELL MARKHAM, M.D.

Lluis B. and Ibáñez, A. S.: Studies regarding Ovarian Adnexitis (Estudios sobre el ovario adnexitico). *Rev. esp. obst.*, 1946, 3, 1.

The object of the authors' work was to see what effect adnexitis has on the ovaries.

The first manifestation is an alteration of the menstrual cycle caused most likely by some ovarian destruction due to an oophoritis or abscess formation. Changes observed because of inflammation of the adnexa in order of their frequency were dysmenorrhea (77) polymenorrhea (48) hypermenorrhea (43) metrorrhagia (41) menorrhagia (22) amenorrhea (20) and oligomenorrhea (8). These were found in the study of 2,000 patients.

The etiologic factors productive of these changes were predominantly gonorrhea and abortion. Other causes, but of negligible proportion, were puerperal fever, appendicitis, lacerations and prolapse.

Sterility secondary to adnexitis was found to be as high as 36 per cent and 12 per cent of these cases had no other symptom. STEPHEN A. ZIEGLER, M.D.

Douglase, Al: Masculinizing Tumor of the Ovary of the Adrenal Type. *Am J Obst.*, 947 53 190

A case of masculinizing tumor of the ovary is reported. A 48 year old white woman had complained of backache, lower abdominal pain, and vaginal discharge for a period of 7 years. Two years previous to her admission to the hospital she developed a loss of scalp hair, generalized hypertrichosis necessitating daily shaving of her facial beard, and a bass tone to her voice. There was a loss of libido, and intercourse became painful. The menses had ceased at 37 years of age. Examination revealed a slight hypertension, a male facies, alopecia, generalized hypertrichosis, bass voice, and male type of breasts. The hemoglobin was 115 per cent and the erythrocyte count 6.0 million. The leucocyte count was 9000. Pelvic examination showed the clitoris to be greatly hypertrophied, the uterus to be smooth, firm and slightly enlarged, and a definite tumor to be present in the region of the right ovary.

At operation the right ovary was 4 cm. in diameter, smooth, oval, and light yellow in color. A subtotal hysterectomy, bilateral salpingo-oophorectomy, and perineorrhaphy were performed. Near the center of the right ovary was a light brown, firm, fleshy tumor mass 1.4 by 1.2 by 0.8 cm. Sections of this tumor showed strands of adrenal-like cells in an irregular arrangement. There was no acinous or tubule formation.

This patient was followed up for a period of 3 years and has shown a complete reversion to the feminine characteristics. A slight facial hirsutism has persisted. The pelvis is normal. Hormone tests for androgens revealed only a high elevation of the normal female values. The author presents the evidence pro and con as to whether these tumors are of adrenal or ovarian origin and believes that this case is typical of a proliferation of an adrenal rest.

JOHN R. WOLFE, M.D.

Block, E. Primary Carcinoma of the Fallopian Tube. *Acta radiol. Stockh.* 947 18 49

Primary cancer of the fallopian tube is a rare disease. A report from the Radiumhemmet shows that from 1922 to 1945 only 16 such cases were admitted, less than 1 case per year.

Since the Radiumhemmet presents a larger series of cases than any hitherto reported, and since the postoperative radiation therapy has been given according to practically unchanged methods, the publication of this material is justified even if nothing especially new can be expected regarding the pathology and clinical course of cancer of the tube.

According to obtainable information in the literature, 379 cases have been reported since Renaud, in 1847 first described primary cancer of the fallopian tube. In 1932 Numbberger, in his textbook, tabulated the 301 cases which had been published up to that time. In 30 per cent of these cases, the carcinoma was stated to be bilateral. In most of the cases it was impossible to determine whether the growth was primary or secondary. The incidence was greatest

in the age group from 45 to 50, but cases have been reported at such an early age as 18 and at the advanced age of 73.

The etiology of cancer of the tube does not differ from that of cancer in other organs, although the cancer generally starts in the fimbriated end of the tube.

Like carcinoma of the ovaries, the tubal cancer long remains latent. Pain is reported to be the most common symptom.

In the presence of a mass in the adnexa, the sero-sanguineous discharge is pathognomonic of carcinoma of the fallopian tube, provided conditions in the uterus and the vagina are normal.

In cases of tubal cancer, bleeding is not a constant symptom.

The treatment is surgical, namely removal of the adnexa. Some authors have suggested hysterectomy. However, in so doing they have not considered the desirability of retaining the uterus for postoperative radium application.

Of the 16 cases mentioned, only 3 had been treated with radium; the 13 others were treated by roentgen irradiation only.

A brief report is given of the 16 cases treated at the Radiumhemmet. Of these 16 cases, 6 were definitely primary, while the remaining 10 were probably so. However, 16 cases are too small a number for a statistical study.

At the Radiumhemmet the radiological treatment of tubal cancer has followed practically the same principles as that of cancer of the ovary, namely: 1. Intracavitary or vaginal radium application followed by roentgen treatment to 2 anterior and 2 posterior fields. The radium dose has varied in the uterus from 900 to 1500 mgrm. hours and in the vagina from 1800 to 3,000 mgrm. hours. The roentgen dose has varied also. In later years, however, 4 doses of 400 roentgens are administered to each of 4 fields in the first series, followed 3 months later by a second series of 4 doses of 400 roentgens to each field.

Tubal cancer is not a hopeless disease provided that a radical operation is performed early and that radiation therapy is administered in accordance with the aforementioned method.

HARRY W. FISK, M.D.

MISCELLANEOUS

Hilt, K. E., Hesselstine, H. C., and Goldstein, L.: A Study of the Bacterial Flora of the Normal and Pathologic Vagina and Uterus. *Am J Obst.* 947 53 33.

The authors report the results of a study of the bacterial flora of the vagina in 218 patients during pregnancy and following delivery. Sixty-one of the patients were normal prenatal cases, 73 were pregnant women who had trichomoniasis, clinically and as were patients with other types of vaginitis during pregnancy. In addition, uterine cultures were obtained during the puerperium from 50 normal patients and 45 pathological cases.

The flora of normal pregnant women revealed the most frequent members to be aciduric rods diphtheroid rods *Staphylococcus albus*, and fungi. Non-hemolytic and anaerobic streptococci were isolated frequently. Other organisms were seen only occasionally or not at all. There was no difference between cultures obtained during the first half and second half of pregnancy.

In the patients with trichomoniasis there was an increased frequency of aerobic and anaerobic streptococci bacteroids, and a lower percentage of aciduric rods. Moniliasis was common in patients with other types of vaginitis.

The uterine cultures obtained from both normal and febrile postpartum patients were remarkable in their similarity. The authors emphasize that the presence of large numbers of various types of organisms makes it difficult to determine the causative organism in infection and thus the effect of treatment must be judged accordingly. They also point out that the postpartum uterus and vagina may be the portal of entry for a more diffuse infection.

JOHN R. WOLFF M.D.

Schmitz, H. E. and Towne J. E.: Radium and Roentgen Therapy in the Treatment of Menopausal Uterine Bleeding. *Am. J. Obst.* 1947 53 199

The control of functional climacteric uterine bleeding presents a problem in which there is no uniform consensus. In view of the multitude of methods of treatment proposed for benign uterine bleedings it is apparent that each type of treatment has definite indications and limitations which should not overlap one another. The authors report 412 cases observed during the five year period from 1939 to 1943 at the Mercy Hospital, Loyola University Clinic, Chicago in which uterine hemorrhage was the indication for radiation therapy.

One hundred and sixteen (38 per cent) of the patients received roentgen ray treatment and 296 (71 per cent) had radium therapy. The authors prefer the latter since curettage always precedes it and subsequent treatment is rarely needed. The indications for this type of therapy are essentially the symptoms of profuse or irregular vaginal bleeding in the presence of normal pelvic findings. The authors show the excellent results that can be obtained in the treatment of menopausal bleeding by this

simple method of treatment. The dangers are exceedingly small and the complications following treatment are minor.

JOHN R. WOLFF M.D.

De Aquino Salles A. and Couri A. A.: Simultaneous Bilateral Ureteroenteroanastomosis according to Davalos Technique in the Treatment of Incurable Vesicovaginal Fistulas (Uretero-entero-anastomose bilateral simultânea pela técnica de Davalos, no tratamento das fistulas véscico-vaginais incuráveis). *Am. bras. gin.* 1946 22 263

Two cases of vesicovaginal fistula treated by a bilateral simultaneous ureteroenteroanastomosis are reported by the authors who believe that possibly their patients were the first on whom this method was employed. The main principle of the operation is the formation of a valve for the protection of the anastomosis and ureters against ascending infection. The method offers the following advantages:

1. The superior and inferior mesenteric arteries remain preserved.
2. Only one incision is made through the sigmoid and in this manner trauma is reduced.
3. The transverse incision across the sigmoid allows the formation of a valve.

Sulfasuxidine administered orally has proved of inestimable value in the preoperative and postoperative care. Briefly the technique is as follows:

The abdomen is opened through a midline incision. The ureters are mobilized and divided. A transverse incision is made through the serosa and muscularis of the sigmoid and is supplemented by a lateral incision. The ends of the ureters are cut on a bevel and sutured to the submucosa without tension. The serosa and muscularis are sutured over the ureters. Mattress sutures through the serosa and muscularis draw the lower edge of the incision over the ureters. The submucosa and mucosa are incised to allow the ends of the ureters to enter the bowel. Finally the edges of the serosa and muscularis are inverted.

Transient anuria, probably resulting from an edema of the distal end of the ureters, was present in both cases on the third postoperative day but it subsided after a short while. The immediate postoperative results were very good. Intravenous urography showed the presence of hydronephrosis shortly after implantation but the condition gradually disappeared.

JOSEPH K. NARAT M.D.

OBSTETRICS

PREGNANCY AND ITS COMPLICATIONS

Chesley L. C., and Annetto J. E.: Pregnancy in the Patient With Hypertensive Diseases. *Am J Obst* 1947 53 372.

The authors' experience with pregnancy in women with hypertensive disease is presented because there are relatively few such studies based upon any considerable series, and in most studies extant there has been a selective factor in that therapeutic abortions have been done in the more severely hypertensive patients.

From 1931 through 1944 there were 318 women at the Margaret Hague Maternity Hospital, Jersey City N. J., in whom the diagnosis of hypertensive disease as defined by the American Committee on Maternal Welfare could be established, and an analysis was made of the 301 pregnancies of these patients.

The gross fetal loss in prior pregnancies was 35 per cent. In the first hypertensive pregnancy 38 per cent and in subsequent pregnancies 40 per cent fetal loss increased with higher initial blood pressure. Second trimester rises in the blood pressure, higher pressures near delivery, decreased renal function (normal in 93% of the pregnancies), proteinuria and superimposed toxemia.

There were 6 immediate maternal mortalities (3%) and 7 late puerperal deaths. Eight deaths were probably associated with the hypertensive disease while 5 were attributable to intercurrent causes. All late puerperal deaths are known to be included since all patients were traced. The authors conclude that while pregnancy very definitely jeopardizes the hypertensive woman the hazards are not great in 3 of 3 cases as two-thirds escape superimposed toxemia.

Nearly 40 per cent of the women showed drops in the blood pressure in midpregnancy, a point of practical importance for diagnosis inasmuch as a diagnosis of pre-eclampsia may be made if the earlier hypertensive pressures are unknown. Also, this factor confuses the interpretation of permanent hypertension apparently left as a sequel of pre-eclampsia.

JOHN R. WOLFE, M.D.

Grasseot J. A Study of the Pathogenesis and Mechanism of the So-Called "Toxic Accidents of Gestation" (Contribution à l'étude de la pathogénie et du mécanisme des accidents dits "toxiques de la gestation"). *Rev f g. obst* 1947 4 350.

Two clinical observations of eclamptic attacks in pregnant women and a series of experimental studies on the guinea pig form the basis for some tentative suggestions concerning the pathogenesis and modus operandi of the eclamptic state. These observations were made before World War II. The data therefrom were compiled by the author while a prisoner and are presented without further documentation or revision.

The first observation was that of a severe case of eclamptic convulsions with deep continuous coma. The convulsive seizures were uncontrolled by alcohol or morphine but the blood pressure of over 200 mm. Hg was practically completely controlled by combined medication with calcium gluconate and hypophosphite of magnesium. The child died during the period of medication.

The other observation was that of a woman with a 5 months' pregnancy who was thrown into a typical eclamptic state with blood pressure of 180-190, convulsive seizures, and coma. The condition was immediately ameliorated as a result of artificial emptying of the uterus, at the end of pregnancy of a living child.

In an attempt to understand the dramatic effects of the combined calcium-magnesium medication and the apparently noxious action of the hypophyseal extract a series of experiments were conducted on guinea pigs. The first experimental series consisted of injections of 10 units of extract of the posterior lobe of the hypophysis into the left ventricle of the heart. This did not produce any accidents of the eclamptic type. Nor were any convulsive seizures elicited by injections of 5 c.c. of serum or spinal fluid from eclamptic women. No typical seizures were produced by combined intracardiac injection of extract of the posterior lobe of the hypophysis and of the serum of the normally pregnant woman. However when the guinea pig was first sensitized by intracardiac injections of distilled water followed 5 days later by 10 units of the extract, there resulted some suggestion of convulsive attacks with other symptoms of anaphylaxis and death in 3 to 5 hours. Twenty units of the post hypophyseal extract produced intense convulsions with death of the animal in a half hour. The same effects, only more intense, were produced by sensitizing the animal with the serum of the normal pregnant woman and injecting the extract of the posterior lobe of the hypophysis after 7 days. The severity of the attacks was proportional to the quantity of serum used. When the serum used was that of an eclamptic woman or a hypertensive pregnant woman the manifestations were much stormier with death in 3 minutes. Thus, an anaphylactic reaction might explain the reactions were it not for the gradations in severity with the different sensitizing media.

The author believes that the posterior lobe of the hypophysis is not of itself able to produce the eclamptic state, that a sensitization of the organism is required, that this sensitization comes from the foreign protein effects of the fetus, and that the upset comes by way of the neurovegetative, particularly the vagosympathetic, system. Thus, the calcium-magnesium salts as the regulator of the neurovegetative system are able to bring about dramatic relief.

JOHN W. BREWER, M.D.

Whitacre F E., Loeb W M Jr and Chin H:
Eclampsia *J Am M Ass.* 1947 133 445

The authors define this disease of pregnancy as probably related to nutritional deficiencies and characterized by a syndrome of symptoms and distinct pathologic lesions which are associated with angiospasm.

The present report comprises data on 100 consecutive eclamptic patients from the obstetric and gynecologic service of the Peiping Union Medical College Hospital, Peiping, China, observed during the years from 1935 to 1947. These cases are compared with those of 100 consecutive eclamptic patients from the department of obstetrics and gynecology of the University of Tennessee at Memphis observed during the years from 1941 to 1945. All the patients from Peiping were Chinese while in the Memphis series 96 were negro and 4 were white. The assertion by numerous authors that eclampsia is a disease of primiparas is borne out by the authors' cases. In the Chinese series 75 were primiparas and 25 multiparas while in the Memphis group 72 were primiparas and 28 multiparas.

With regard to the appearance of convulsions in relation to the labor in 75 of group 1 the convulsions were antepartum, in 10 intrapartum, and in 15 postpartum, while in 77 of group 2 they were antepartum in 6 intrapartum and in 17 postpartum. The stage of gestation conformed to the reports of others as in 93 patients in group 1 and 90 patients in group 2 eclampsia occurred after the sixth month of pregnancy. In both groups the disease occurred among the underprivileged or indigent who could be expected to have nutritional deficiencies.

It has been noted that the duration of hypertension might be more important than the severity of the disease that is the patient with an elevation of blood pressure which had been existent for several weeks might suffer permanent renal damage even though convulsions did not occur. However in a rapidly developing toxemia which lasted only a few days even though attended with convulsions there might be no permanent damage to the kidneys.

A study of the data contained in this report brought out several factors. Race did not seem to be significant. There was no appreciable difference in the two groups with regard to the ages and parity of the patients concerned. The stage of gestation was almost identical. The blood chemical findings are very similar and the lower blood pressures in group 1 are in accord with the low blood pressures which are found in general among the Chinese. The high incidence of eclampsia among the Chinese is significant, and the incidence in the Midsouth is unusually high. This high incidence will be reduced only when the public is better informed on the benefits of prenatal care which includes advice in regard to a properly balanced diet during pregnancy. The mortality rate among eclamptic patients in either Peiping, China or Memphis, Tennessee does not compare favorably with the mortality reported by others.

Figures on the red blood cell counts and hemoglobin determinations are somewhat lower than those commonly reported. In the toxemic group they are difficult to evaluate because of the blood dilution of pregnancy and the blood concentration associated with the toxemias. Total plasma protein determinations were not significant except when appreciably lowered.

Electroencephalographic tracings were made on 6 eclamptic patients during convulsions. All the tracings are similar but those used in this report were more clear-cut. It is significant that an eclamptic patient treated with veratrum viride gave the same type of tracing. One might contend that the alteration in the tracings is the result of the fall in blood pressure and this is probably correct for the fall in blood pressure is due to the relief of angiospasm whether by the use of regional nerve blocking or by the action of a drug such as veratrum viride.

It seems reasonable to conclude that angiospasm is probably both the immediate basis for the syndrome of eclampsia, accounting for the gradual or sudden rises in the blood pressure and the suppression of urinary excretion and the exciting cause of the convulsive seizures in some patients. The placenta is probably the stimulating factor in the patient a production of precursor substances. Methods of medical management rely for their success on the relaxation of angiospasm directly or indirectly.

CHARLES BARON, M.D.

LABOR AND ITS COMPLICATIONS

Brouse L. T.: Hemorrhage following Gestation (Hemorrhage consecutive to a gestosis) *Obst. gyn. Int. Soc.* 1946 4 749

Brouse believes that during labor uterine inertia in the eclamptic is brought about by toxic cellular edema, the excessive interstitial fluid so disorganizing the muscle fibers that atony results. In fact it is intimated that the occurrence of uterine atony angers a previous eclampsia. Moreover in such uteri intractable hemorrhage is so certain in the majority of instances that oxytocics, massage, transfusion, and stimulants may be ineffectual and, unless hysterectomy is done acute anemia or even death may ensue. The mortality figures for this condition in the author's hospital were 11 per cent and the frequency of the disorder is considerably more than is generally believed.

A subperitoneal vascular apoplexy may extend with thrombosis into the adnexa, or rupture may occur into the peritoneal cavity. Partial or total placental separation is usually associated with this apoplectic form. There does not seem to be much relationship however between the organic lesion, uterine function and the general condition of the patient. Moreover the symptoms may not follow the characteristic pattern even when there is complete detachment of the placenta nor does this accident necessarily produce fetal death in the uterus. It is said that because of the frequency of trauma

shock and the other physiologic changes caused by hemorrhage may occur readily in obstetrics. The treatment of 120 cases reported from 1936 to 1944 is discussed.

STEPHEN A. ZIEGLER M.D.

Eastman, N. J.: Pituitary Extract in Uterine Inertia. Is It Justifiable? *Am. J. Obst.* 1947 53 432.

While procedures employed in the management of uterine inertia are rather well standardized, cases of primary uterine inertia may occasionally prove refractory to treatment. The author discusses the desirability of using a really effectual uterine stimulant such as pituitary extract.

Two hundred and thirty-three ward cases at Johns Hopkins Hospital, Baltimore are considered, practically all of which were examples of true, often severe, inertia. It is emphasized that uterine inertia and prolonged labor are not synonymous, because prolonged labor may be entirely normal and physiologic, provided that steady if slow progress is made. Uterine inertia is present when there is prolonged absence of progress in the presence of weak contractions. As a rule, pituitrin was not given until from 18 to 24 hours of labor had elapsed with weak pains and a stationary cervix, and after all the usual expedients had proved ineffectual. The problem regarding pituitrin was not so much one of using pituitrin versus further temporizing as it was one of using pituitrin versus some radical method of delivery.

It is acknowledged that even if all precautions are exercised, pituitary extract, when given in the first or second stages of labor, will occasionally cause the death of the infant and, less frequently may result in rupture of the uterus; hence it is a dangerous drug when given before the birth of the baby. But, since uterine inertia also takes its toll in terms of intrapartum infection, exhaustion, difficult forceps delivery and Dührssen's incisions, the author slightly favors the use of pituitary extract, provided that these rigid rules be observed.

1 The case must be one of true uterine inertia, primary in character with labor practically at a standstill and progress nil.

2 The patient must be truly in labor, not in false or prodromal labor.

3 There must be no mechanical obstruction to easy delivery as attested by every type of evidence including x-ray study of the pelvis and fetal skull.

4 Patients of great parity having borne 4 or more children, must not be given pituitary extract because their uteri rupture more readily than those of women in the lower parity brackets.

5 The condition of the fetus must be good, as evidenced by a regular heart beat and absence of meconium stained liquor amnii. A dead fetus is no contraindication to pituitary extract.

6 The obstetrician must observe and time the first contraction after administration of the drug and give inhalations of ether if it lasts longer than 3 minutes.

7 The initial dose must not exceed $\frac{1}{4}$ minim. This dosage should not be exceeded unless it is clear

that no improvement in pains whatsoever comes. In the latter event it may be increased to 1 minim, but under no circumstances should more than 1 minim be given at a time. A period of 30 minutes must intervene between injections.

8 When there is doubt as to whether a given case meets these criteria, pituitary extract should not be given.

JOHN R. WOLFE M.D.

PUERPERIUM AND ITS COMPLICATIONS

Beecham, C. T.: An Analysis of Deaths from Postpartum Hemorrhage. *Am. J. Obst.* 1947 53 442.

The author, from the Maternal Welfare Committee of the Philadelphia County Medical Society reviews 550,489 deliveries of live and dead infants in Philadelphia during the 15 years preceding 1945, among which there were 1,987 maternal deaths. One set of mortality figures was constant over these 15 years: those due to postpartum hemorrhage, and averaged 11.4 deaths a year. The Committee has judged 78 per cent of these deaths to be preventable; 63.5 per cent were judged preventable because of errors in judgment or technique on the part of the attending obstetrician and the remainder because of factors pertaining to the patients themselves.

Two-thirds of the patients had various obstetric operations, the vast majority of which the Committee believed were not indicated. Manual dilatation of the cervix and version was uniformly condemned, as there was a very high incidence of stillbirths among the cases so treated.

Study of these 168 case reports of postpartum hemorrhage revealed that many factors had been overlooked and too often hemorrhage was the result of gross carelessness. One of the glaring omissions was good prenatal care, particularly in regard to the nutritional state and study of the blood picture. A third factor in the prophylaxis of hemorrhage is routine typing of all prenatal patients. Prophylaxis against hemorrhage is carried further in labor. The Committee records were incomplete on the indication used or its judicious application. There was even less evidence of measures employed to combat fatigue and exhaustion. Conclusions regarding anesthesia as a factor contributing toward postpartum hemorrhage were not drawn inasmuch as figures on regional anesthesia were too limited. The author lists several obvious errors in the management of the third stage of labor found by the Committee. As to the etiology of postpartum bleeding, 75 instances of bleeding from an atonic uterus were noted. The cause of the atony in most cases added up to multiple factors ranging from inadequate prenatal care to the choice of anesthetic.

Treatment in the majority of cases was far from ideal. First, there was the failure to utilize oxygen. Second, uterovaginal packing was used in only 16.5 per cent of the cases. Third, transfusions are given to only 25 per cent of the patients at a time when it could help. The amounts of blood used were inadequate, since the average was only 500 c.c. The Com-

mittee believes that these measures more than any thing else are important in combating hemorrhage. It is understood that oxytocics the Trendelenburg position and stimulation are in order but cannot compare with these three major forms of treatment.

JOHN R. WOLFF M D

Mollnengo, L.: *Carcinoma of the Rectum and the Puerperal State* (*Carcinoma del retto e stato puerperale*) *Ginecologia*, Tor 1947 13 17

The first case of carcinoma of the rectum during pregnancy was reported in 1843. During the intervening 100 years, only 55 cases have appeared in the literature.

After giving a brief resume of the cases which have been reported during the past 20 years, with the observations made by the various reporters the author reports a case of carcinoma of the rectum during pregnancy which was treated by him at the Mauriziano Hospital in Turin.

The patient was a 39 year old housewife who had had 3 normal pregnancies and a fourth pregnancy which was interrupted spontaneously one year before her first entry into the hospital on February 3, 1945. At that time she had experienced pain in the anal and perineal regions for 6 months. For 3 months the pain had increased to such an extent that it was almost unbearable. It was accompanied by constipation, painful defecation when the bowels did move and a mucosanguineous rectal discharge. She had missed 1 menstrual period.

Physical examination showed the patient to be in fairly good general condition. Pelvic examination revealed an enlargement of the uterus to the size of a 3 months pregnancy. There was a hard tumor slightly painful on palpation ill defined and occupying the median part of the posterior vaginal wall. The overlying mucosa was normal in appearance. Rectal examination revealed the presence of a tumor on the anterior rectal wall from 4 to 5 cm. in length and about 3 to 4 cm. from the anal orifice. The upper extremity of the tumor was well defined laterally it extended into the walls of the rectum. The overlying rectal mucosa was fixed to the deeper tissues and in consistency it was hard and rough because of the presence of multiple small irregularities about the size of a small pea. There was a rosy tinted rectal discharge.

The patient entered the hospital on February 3, 1945 with a tentative diagnosis of adenocarcinoma of the rectovaginal septum and pregnancy of 3 months duration. This diagnosis was confirmed after admission. Although operation was advised the patient refused surgical treatment and was discharged a week later.

A month later the patient returned to the hospital for the pain had become continuous and was relieved only by morphine. In addition the patient had experienced nausea vomiting anorexia obstipation and frequent defecations of bloody rectal discharge. Physical examination revealed pregnancy in the third month and an increase in size of the

rectal tumor which had extended in all directions. Its surface presented an irregular ulceration from 4 to 5 cm. in diameter. There was a fetid sero-sanguineous rectal discharge.

On March 12, 1945 the cervix was dilated and the uterus emptied.

On March 28, 1945 the rectum was excised by the sacroperineal route. A triangular area of the posterior vaginal wall was also excised. The vagina and perineum was reconstructed. The amputated end of the intestine was freed and brought down to the sacrococcygeal region where it was fixed.

Microscopic examination of the tumor confirmed the diagnosis of adenocarcinoma of the rectum.

Postoperative convalescence was uneventful and the patient was allowed up on the sixteenth day.

Follow up examination, a year later, revealed the patient to be in good condition both subjectively and objectively. The vagina had cicatrized perfectly and allowed conjugal relations. The sacral anus was functioning satisfactorily.

On account of the rarity of the finding of carcinoma of the rectum during pregnancy there have been numerous speculations as to the reason for it. The 2 most common explanations are (1) that carcinoma of the rectum is rarer in females than in males, and (2) that it appears most often in the fifth decade of life when fecundity in the female has practically disappeared.

Of the 55 patients with carcinoma of the rectum during pregnancy whose cases were reported the youngest was a woman of 18 years while the oldest was a woman of 43 years. According to age the 55 patients were found to be as follows: 1 was less than 20 years of age, 7 were between 21 and 25 years, 12 between 26 and 30 years, 11 between 31 and 35 years, 10 between 36 and 40 years, and 5 between 41 and 45 years.

Carcinoma of the rectum in general occurs most frequently in the fifth decade of life but carcinoma of the rectum during pregnancy occurs most often before or during the third decade of life.

Pregnancy may be a predisposing factor in the production of carcinoma of the rectum. During pregnancy there is an increased congestion in all of the pelvic organs. Pressure is exerted on the rectum and hemorrhoids occur as a common complication of the pregnant state. Hemorrhoids ulcerate and give rise to bloody discharges. This may lead to more serious changes.

Pregnancy may in some way be the cause of producing cancer of the rectum and cancer in general. Two cases are cited by the author from the literature in which several cancers occurred during pregnancies in the same woman. One woman of 31 years was operated upon for cancer of the rectum following delivery she was well for 7 years when another pregnancy was interrupted spontaneously at the fifth month. Two months later she developed intestinal obstruction due to a cancer of the ascending colon. Four years later at the menopause she was treated for cancer of the bladder.

Another patient, a multipara 32 years of age, with a hereditary neoplastic history was operated upon for carcinoma of the rectosigmoid flexure after her eighth delivery. She was well for 8 years then 20 days after a normal delivery of her ninth child she underwent an operation for cancer of the rectum, which had invaginated into the ascending colon. Two years later the patient delivered her tenth child prematurely at the eighth month at which time a stenosing cancer of the artificial anus (made during her second operation) adhering to the posterior vaginal wall, was removed. In these last 2 cases, the pregnancy seemed to have some direct connection with the appearance of the tumors. To avoid recurrence of malignancy during pregnancies, sterilization has been recommended as a prophylactic measure.

Carcinoma of the rectum during pregnancy may be easily overlooked. Whenever untoward signs or symptoms develop rectal examination should be made for such common signs as bleeding hemorrhoids, discomfort from intrapelvic pressure and constipation as they may be due to the presence of a cancer of the rectum.

If cancer of the rectum is diagnosed as inoperable late in pregnancy delivery by cesarean section when the child is viable, is recommended to save the life of the child. Palliative x ray treatment may then be given to the mother.

If inoperable cancer is discovered early in pregnancy it is deemed advisable to induce abortion and then administer vigorous therapy by means of roentgen irradiation.

When cancer is deemed operable radical removal of the cancer of the rectum should be done immediately to benefit the mother irrespective of the life of the child. Abortion may or may not be done before the radical operation. If the patient undergoes radical operation and the pregnancy goes on to term, then delivery by cesarean section is regarded as being the safest method.

BLACKWELL MARKHAM, M.D.

MISCELLANEOUS

Romero, C. G.: Alterations of Body Weight during Gestation, Parturition, and the Puerperium (Las alteraciones del peso corporal durante la gestación, parto y puerperio) *Rev. esp. obst. ginec.* 1945, 3: 15

Alterations in the body weight of the pregnant woman were closely studied during a 2 year period at the author's clinic. It was possible to classify the patients into four groups.

1. The normal group in which increase in weight was constant and gradual ranging between 500 and 1,500 gm., with a sudden transient rise during the seventh month.

2. This group is characterized by a rapid rise during the first 3 months probably due to endocrine hyperfunction. Adjustment occurs and the weight curve follows according to the normal range during the latter months of pregnancy.

3. This group has an increase in weight along normal lines up to the seventh month. Then there is a sudden exaggerated increase for metabolic reasons with the formation of edema. These changes are considered pathologic.

4. The fourth group may have a diminution or no appreciable weight change during the first 3 months. Then there is an irregular weight increase inasmuch as the gain is under the normal. The cause is considered to be of neurovegetative origin, such as a lack of appetite vomiting or hyperemesis, during the early months of pregnancy.

The multiparas show a slightly greater increase in weight than the primiparas. Constitution and stature have some influence as well as twin pregnancy and such chronic processes as heart disease tuberculosis diabetes asthma nephritis, and lung.

Among the causes enumerated for weight increase are amniotic fluid size of the uterus and placenta, endocrine imbalance salt retention, capillary permeability hypoproteinemia nephritic and pre-eclamptic edema, and deranged water metabolism.

STEPHEN A. ZIEGLER, M.D.

GENITOURINARY SURGERY

ADRENAL, KIDNEY AND URETER

Piero, C.: Suprarenal Apoplexy Associated with Sepsis (Apoplexia surrenalis in decurso di sepsi) *Minerva med.* Tor 1947 38 146.

A 40 year old woman entered the hospital with mild symptoms referable to the right lower quadrant and died on the sixth day of her hospital course. Autopsy findings included evidence of bronchopneumonia, with generalized sepsis and hemorrhagic phenomena involving the brain and meninges as well as the serous membranes of the abdomen and thorax the right ovary the left kidney and the suprarenal glands.

The author points out that the course did not conform strictly to descriptions of the Waterhouse-Friderichsen syndrome but that the finding of gross hemorrhage in the suprarenal glands justified consideration of that classification.

He postulates that the illness began with an episode of bronchopneumonia which developed into generalized sepsis and that the response to the generalized invasion was essentially a sensitized one manifested by hemorrhages and exudative changes involving the myocardium spleen kidneys, leptomeninges, liver and suprarenal glands. The organism isolated was the *Pneumococcus* rather than the meningococcus described in connection with the Waterhouse-Friderichsen syndrome. However the pathogenesis conformed so well to that of this syndrome that the hypothesis that bacteria other than the meningococcus could produce this clinical entity seemed justified, provided that opportunity had been given for the sensitization of the skin and suprarenal glands. EDITH B. FARNSWORTH M.D.

Bacon, S. K.: Hydronephrosis of Supernumerary Kidney *J Urol* Balt. 1947 57 459

Supernumerary kidney is a rare anomaly which occurs when duplicated or bifurcated excretory ducts extend cranially to enter two independent metanephrogenic masses. They develop into two separate renal entities. The following case of hydronephrosis of a supernumerary kidney is presented.

A woman, age 47, was admitted to the hospital for right lower quadrant pain of many years duration, and right lower quadrant tenderness without masses. Appendectomy was done after the finding of a mass of intraperitoneal adhesions. One particularly prominent band was encountered, which might possibly have been a right ureter. One week after operation the right side of the abdomen began to enlarge. On the thirty first day, examination revealed the presence of a large cystic mass in the entire right side of the abdomen. Cystoscopic studies revealed an enormous right hydronephrosis with normal appearing renal substance above it. With indwelling catheter drainage the mass disap-

peared. It was concluded from x ray studies that a normally formed right kidney existed above the hydronephrosis. At operation two separate kidneys were found. The cranial organ was normal. The caudal kidney presented a far advanced hydronephrosis which was densely adherent to the peritoneum, colon, and vena cava. The organ was removed and the postoperative course was uneventful save that a ureteral stricture was discovered which responded to dilatation. ROBERT O. BEADLES, M.D.

Engel, W. J.: Calicectomy for Stone *J Urol* Balt. 1947 57 619

The good result obtained by partial nephrectomy in a group of 9 patients with caliectasis from stone 5 years or more after operation prompts the author to report this series. The operation is indicated in patients with dilated upper or lower calyces containing calculi in whom it seems apparent that simple removal of the stones would leave behind an abnormal calyx in which urinary stasis would favor the formation of stone. In all of these cases the operation was deliberately planned following urologic study, a method preferable to decision at the operating table.

The technique is described as employing the usual oblique lumbar incision spinal anesthesia generally being used. A cobbler type stitch across the pole to be resected controls the bleeding. This stitch is placed as soon as the pole is mobilized and before the capsule is incised (Fig. 1). After it is snugly tied,

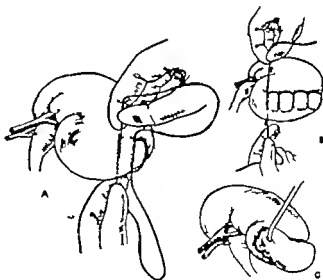


Fig. 1 (Engel) Diagrammatic sketch showing placement of cobbler type of stitch for renal compression. A, First stitch has been placed. B, Second is being started by inserting needles from opposite surfaces of kidney. Catgut suture, with double end straight, atraumatic needles, is employed. C, Shows suture completed and tied on opposite side of kidney.

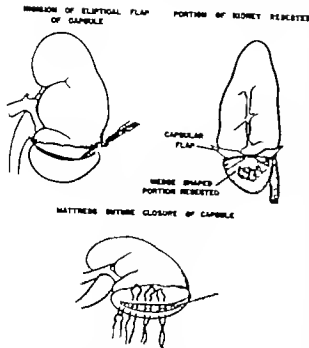


Fig. 2. (Engel). Showing various steps in operation for partial nephrectomy

an elliptical incision is made in the capsule distal to the line of suture, and the capsule is stripped back. The pole is then removed by a wedge shaped incision and the capsule is sutured across the cut surface with interrupted mattress sutures (Fig. 2). If there is some bleeding a piece of muscle or fat is sutured against the cut surface, or a thrombin impregnated absorbable sponge may be used. Nephrostomy or pyelostomy drainage was not employed and there were no postoperative fistulas. In all cases drainage was placed to the operative site.

A review of the series reveals no operative deaths. The average postoperative stay was 13 days, with a minimum of 11 days and a maximum of 15 days. Observation of these patients for from 5 to 13 years following operation reveals no case of recurrent stone. In all of the patients the remaining portion of the kidney is functionally active as measured by diatriz excretion in the intravenous urogram and in several patients the kidney pelvis appears almost normal. In 8 of the 9 cases there was evidence of urinary infection at the time of operation however in all cases the urine was negative at the time of the most recent follow-up examination. Sufficient functioning renal tissue is conserved to sustain life should disease or injury destroy the opposite kidney.

JOSEPH E. MATTHEW, M.D.

FRANZES, F: Pararenal Abscesses. *Acta. chir. scand.*, 1946 94 Supp. 116

FRANZES studied 100 cases of pararenal (perinephritic) abscesses 85 of which were followed up for

periods ranging from 2 months to 16 years after discharge from the hospital. Operation was performed on 97 patients. Pararenal suppuration occurred on the right side in two-thirds of the cases, and it affected the rural population 6 1/4 times as often as the urban population.

Contaneous foci of infection, such as furunculosis, cellulitis, and wounds, caused pararenal infection most often. In 10 per cent of the cases trauma to the lumbar region was the primary cause. Physical exertion was also of etiologic importance. Chronic renal disease was of etiologic significance in about 5 per cent of the cases. Abdominal, thoracic, and genital inflammatory processes caused pararenal infection in relatively few cases.

Urinary abnormalities are not of diagnostic importance. On the other hand, the roentgenogram is of importance. In 16 of 17 cases examined, mobility of the diaphragm was reduced on the affected side. In 21 of 24 instances the delineation of the psoas muscle was absent. In 14 of 21 cases pleuritis was discernible, and in 11 instances an exudate in the pleural cavity was found. Diagnostically the roentgenologic findings were more important than the pyelogram which elicited hydronephrosis (caused by ureteral compression) in a few cases.

The diagnostic puncture is of value and should be performed in several directions if pus is not obtained on the initial examination. The danger of intercostal perforation is slight.

Treatment by incision alone is insufficient. The abscess cavity should be explored and multifocal retention pockets broken up to promote perfect drainage and to avoid retention of collections of pus. Nonfatal complications occurred in 9 cases. The mortality rate in this series of cases was 19 per cent.

ROBERT TUNELL, M.D.

KILIK, M: Extraction of Ureteral Stones. *J. Cui Balt.*, 947 57 473.

The instrument. The Balkus modification of the Zeiss looped catheter was used by the author because the materials needed were readily at hand. It was found that 5 F whistle tipped catheters and No. 31 to 35 steel suture wire were the most adaptable. With some personal modifications this apparatus was used throughout the study. These modifications were as follows: (1) the length of the loop was varied between 5 and 7 cm., with an optimum of 6.5 cm. (2) more lightly radiopaque than the standard x-ray catheters were employed for better contrast with stone shadows (3) a marker was placed 2 cm. distal to the tip of the closed loop to signal its approach to the bladder (4) another marker was included on the pull filament to denote closure of the loop (5) progressive changes in the type and installation of filaments were made because troublesome kinks sometimes occurred in the steel suture wire (the most satisfactory material proved to be dermalon, size 0 or 00) (6) it is planned to flatten and stiffen the loop to improve stone fixation and to insure a wide open noose.

The technique for the successful use of this instrument includes certain refinements. For purposes of organization, it may be divided into 5 parts: (1) preparation of the patient (2) passage of instrument (3) formation of loop (4) engagement of stone (5) mode of traction.

1. Preparation of the patient. Preliminary cystoscopy and retrograde pyelography are the rule. These procedures are considered manipulative whether the diagnostic catheter passes by the stone or not. Thereafter spontaneous passage is awaited for 3 to 5 days before extraction is attempted.

2. Passage of instrument. Any cystoscope permitting the passage of 5 F catheters suffices. Rubber tip connectors with large loose eyes are important. Cold water for irrigation insures maximum catheter rigidity. The loop must be tested before insertion, and lubrication of the filament within the lumen of the catheter is wise. The most important factor in the passage of the instrument by the stone is patience. After passing by the stone, the catheter is left indwelling for 10 minutes. Before its removal the renal pelvis is filled with air. The impression has been gained that air in the ureter being moved by peristalsis loosens and shifts the stone. The instrument is then passed by the calculus through the channel recently vacated by the indwelling catheter.

3. Formation of the loop. The instrument is always passed to the pelvis if possible. Although the loop can be formed in the ureter this maneuver is much easier in the wide pelvic area. One hand pushes on the catheter as the other pulls on the filament. A marker on the pull filament measures the change but in addition a slight tap is felt as the tip of the catheter hits its sides upon completion of closure.

4. Engagement of the stone. The loop is trolled down the ureter under cystoscopic vision of the ureteral orifice. All pull is confined to the filament to maintain complete closure of the loop. Pull is continued through the cystoscope until the stone is engaged or the tip of the loop appears in the bladder, after which the cystoscope is removed. The tip of the loop eventually catches on the sheath and prevents further traction. Extreme patience and deliberation are essential in drawing the loop down the ureter. Ten seconds per centimeter have been found quite satisfactory before the stone is engaged, and affords sufficient time for the stone to drop into the noose. Engagement produces a certain hang or tug, whereas passage of the loop down a normal ureter is unimpeded. The tip of the loop may hang on the ureteral orifice but a slight twist usually releases it. Roentgen rays are used to confirm engagement.

5. Mode of traction. All traction in this study has been manual. Continuous pull has never been used and contraptions applicable to such have not been employed. Manual traction has been restricted to doctors whether the patient has been on the cystoscopic table or in bed. If the stone resists a 2 pound pull over a reasonable period of time, the ap-

paratus is left indwelling. Many have been left indwelling from a few hours to 6 days. A maximum pull of 3 pounds is exerted 3 or 4 times daily if necessary. Traction is confined to the filament unless a knot has fixed this to the catheter. Between pulls the end of the apparatus is taped to the patient's abdomen. Traction is steady or intermittently deliberate never jerky. A small spring type scale may be used to determine the weight of pull, when desired. If the stone becomes disengaged it is either relooped immediately or later as the case might be.

The results obtained were as follows:

Every stone which could be passed by and engaged was extracted, except one. A small stone in the intramural segment which could not be passed by again after disengagement. Transvesical ureterolithotomy proved necessary because of obstruction and infection. This failure may rightfully be blamed on the operator's inexperience, and impatience at the time of traction. Certainly it was not the fault of the instrument. Sixteen stones could not be passed by with any instrument at any time and 10 of these were removed by operation. The remaining 6 stones were smaller and passed spontaneously after manipulation.

JOHN A. LOXRY, M.D.

Young, J. N.: Retrocaval Ureter with Description of an Operative Case Complicated by Ureteric Calculus. *Brit J Urol* 1947 19 55

The thirty-sixth case of retrocaval ureter is reported and the embryology and literature of this rare anomaly are briefly discussed. Of the 35 cases previously described 12 were found at operation and 23 at autopsy. There are no symptoms typical of this condition.

The case reported was that of a 24 year old female dwarf who was hospitalized for right renal colic. X-ray examination demonstrated a calculus lying to the right of the lumbar vertebra and small calculi in the left kidney. Intravenous urography showed a right hydronephrosis and the ipsilateral renal pelvis was poorly visualized.

At operation the ureter was found to pass medially behind the vena cava about 2 inches from the ureteropelvic junction. The calculus was found in the ureter as it emerged from behind the vena cava. The calculus was removed.

A plastic procedure was not done to remove the ureter from behind the vena cava since the dilatation of the right kidney was thought to be adequately explained by the presence of the ureteral calculus. The postoperative course was uneventful.

ROBERT LICH, JR., M.D.

Davalos, A.: A New Technique of Ureterointestinal Anastomosis. *J Urol* Balt., 1947 59 701

The technique which is to be described was carried out on 17 dogs, with excellent results in 8 of the 15 dogs thus far sacrificed. Fair results in 4, and a poor result in 1 dog. In 2 instances the results were not known. The purpose of this work was to attempt to develop a procedure that would be applicable to

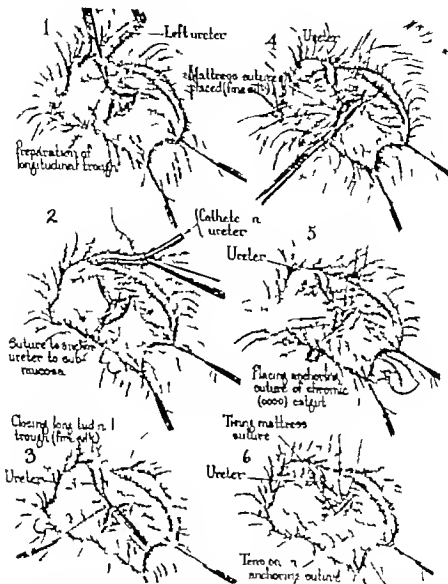


Fig. (D yakov) 1. Preparing longitudinal trough. 2. Anchoring left ureter to submucosa. 3. Closing longitudinal trough with fine silk. 4. Mattress suture of fine silk placed in edges of incision. Making ostium in sigmoid. 5. Placing anchoring suture in mucosal flap. 6. Tying mattress suture as tension is made on anchoring suture.

early cases of carcinoma of the bladder which would be free of many of the hazards of previously described methods, and which would permit visualization of the uncompressed ureter emptying into the bowel.

The preoperative preparation took 3 days. During the first day a clear fluid diet was given, along with sulfadiazine and an enema was given that night. On the second day, the preparation was the same except that magnesium sulfate was given in addition and on the third day water alone was permitted by mouth the chemotherapy was continued, and the patient was given an infusion of 2,000 c.c. of

10 per cent glucose in saline solution, hard candy and 1 c.c. of prostigmin (1:2,000) every 6 hours. Enemas were given at night until the return was clear and on the day of operation the parenteral fluids, sulfonamides, and prostigmin were continued.

Continuous spinal anesthesia was used, and the ureters were approached transperitoneally through a transverse suprapubic incision which divided the recti. After the ureters were severed from the bladder a point on the anterior aspect of the rectosigmoid was chosen which was free of mesenteric circulation. A 3½ cm. transverse incision was made in the sigmoid to expose the submucosa. A small incision

sion was made in the upper border of the wound to form a trough as shown in the illustration and after the ureter was placed in this trough it was closed with two interrupted fine silk sutures. Mattress sutures of fine silk were then placed in the wound to draw the edges of the transverse incision over the ureter. The mucosa was then incised transversely and an anchoring fine catgut suture was placed in the mucosa to draw the ureter into the bowel. The mattress sutures were then tied and a single additional interrupted suture was placed between the mattress sutures to reinforce the closure. The transplant area was then covered with the posterior reflexion of peritoneum to extraperitonealize the operative area and fix the sigmoid and thus prevent tension. The same procedure was followed in transplanting the opposite ureter. The right ureter was usually transplanted first. The author also illustrates this technique in transplanting a double ureter.

Inserting a small silver cannula in the intramural ureter. The cannula, attached to the outside by a black silk suture, is removed in 96 hours. In determining the amount of heat that can be safely applied without destruction of the bladder wall, the tolerance of the gloved finger held in the vagina or rectum is used as a criterion.

Deep x ray treatment is recommended as a therapeutic adjunct in the treatment of bladder tumors.

CLARENCE V. HODGES, M.D.

Ritter, J. S.: Cystectomy for Carcinoma of the Bladder. *J Urol* Balt. 1947 57 719.

The author states that once the diagnosis of infiltrating cancer of the bladder has been made, total cystectomy is the procedure of choice. He favors bilateral cutaneous ureterostomy rather than ureteroenteric anastomosis for diversion of the urinary stream.

In 7 cases the perineoabdominal technique of total cystectomy with implantation of the ureters to the skin, was carried out. The entire procedure was performed at one sitting in from 1 to 1 1/2 hours. There were no operative deaths.

With the patient in the exaggerated lithotomy position the usual perineal exposure is made as for perineal prostatectomy. The membranous urethra is divided and ligated. The prostate, seminal vesicles and bladder neck are then mobilized posteriorly laterally and anteriorly as high up as one can reach. After wrapping a large lap pad around the free end of the urethra, the mobilized portions are thrust up into the pelvis. The perineal wound is closed around a small Penrose drain. With the patient in the dorsal position a transverse suprapubic incision is made about 4 cm above the symphysis pubis, through the skin and anterior rectus sheath. The recti muscles being separated vertically the transversalis fascia is separated from the under surface of the symphysis pubis. After separating the bladder and peritoneum laterally down to the origin of the obliterated hypogastric arteries, the separated prostatic extremity is brought upward, and the bladder prostate, and seminal vesicles are separated posteriorly from the rectum. The mobilization of the bladder is carried out in a retrograde manner. As the ureters are encountered, they are clamped, cut close to the bladder and intubated. The vessels supplying the bladder are clamped, divided and ligated as they are encountered. The intimate peritoneal attachment overlying the bladder is clamped, the bladder is cut away and the peritoneum sutured. The wound is packed with iodoform gauze, the packing being brought out through the wound. The ureter on either side is freed retroperitoneally and brought out to the skin surface through a stab wound preferably in the posterior axillary line.

The author also suggests that the total cystectomy procedure here described be employed in cases of carcinoma of the prostate gland.

CLARENCE V. HODGES, M.D.

BLADDER, URETHRA, AND PENIS

Corbun, B. C. and Corbun, B. C. Jr.: Thermal Treatment of Vesical Tumors. *J Urol* Balt., 1947 57 739.

The authors present a plea for the more universal application of electrically induced heat in the treatment of bladder cancer. They believe that tissue coagulation, because of additional penetration is far superior to fulguration.

Tumors from 1 to 1 1/2 cm. in diameter are handled adequately by transurethral methods. When transurethral electrocoagulation with bipolar current is employed, it is necessary to use the largest active electrode passable through an operating cystoscope. If there is any recurrence a suprapubic cystotomy and electrocoagulation of the tumor followed by x ray therapy should be performed.

All large tumors should be treated transvesically. Use of the flat metal disc as the active electrode produces the maximum amount of available heat in destroying a tumor involving or adjacent to, the prostatic urethrum. damage to the ostium is avoided by

Tashiro, S., and Hinman, F., Jr.: Perirethral and Perirectal Infections. *J Urol Balt* 947 57 338.

Attempts to interpret the clinical distribution of perirethral phlegmon along the classical fascial planes which limit sterile extravasated urine may delay diagnosis and confuse attempts at rational treatment. Many of these septs break down under the influence of infected urine and pus and allow dissemination of infection with little regard for the classical routes of spread.

Extravasation from the penile urethra may be limited to the penis by Buck's fascia, or may penetrate this layer and spread beneath Colles fascia, similar to its spread after perforation of the bulbous urethra.

Most commonly the infection begins in the bulbous and bulbomembranous urethra, since this is the most frequent site of stricture and penurethritis. Infection erodes and dissects anteriorly in the space beneath Colles fascia (since this area is proximal to the origin of Buck's fascia) and over the abdomen beneath Scarpa's fascia. In an occasional case it will spread posteriorly and break through Colles fascia beneath the superficial transverse perineal muscle and enter the ischio-rectal fossa.

If the defect occurs in the membranous urethra, the infection fills the potential space between the superior and inferior layers of the urogenital diaphragm and usually breaks out through the inferior layer to spread anteriorly beneath Colles fascia. It may ascend through the superior layer and thence into the retroprostatic tissue or into the anterior prolongations of the ischio-rectal fossa. Lastly it may break directly through the posterior fascia of the urogenital diaphragm into either ischio-rectal fossa.

Perforation of the membranous urethra at its junction with the prostatic urethra, on the pelvic side of the urogenital diaphragm, allows access of the infection to the ischio-rectal fossae by way of their anterior prolongations.

Because of the low resistance of the loose areolar tissue of the perirectal area and the weakness of the superficial pelvic fascia compared to Colles fascia, periurethral infections from any part of the posterior urethra may appear at the surface about the rectum before superficial changes are observed in the urethral area and anterior perineum.

A perirectal abscess usually arises from an infected rectal crypt or mucous gland, enlarges in the ischio-rectal or superficial perirectal space and eventually ruptures spontaneously either into the rectum or through the skin of the posterior perineum. More often than is generally thought the infection will pass beneath the superficial transverse perineal muscle and localize about the bulbous urethra. It may then spread about the genitalia and over the abdominal wall. The perirectal abscess may also fill the anterior prolongations of the ischio-rectal fossa and thereby impinge on the upper end of the membranous urethra as it emerges from the urogenital diaphragm, or it may compress or cause thrombosis of

the internal pudendal vessels as they come along the lateral wall of the ischio-rectal space. Any of these alternatives may cause urinary difficulty.

In the experience of the authors, perirethral phlegmon and far advanced perirectal abscess frequently have not been differentiated before operation. It is important to differentiate between these diseases preoperatively because the surgical treatment differs in important respects. In extravasation (septic or sterile) the necessity for immediate crico-tomy in addition to radical incision is evident, whereas spreading perirectal infections demand adequate and often extensive incision and drainage but crico-tomy may not be indicated. Furthermore extravasation is usually a urological problem while perirectal abscess is treated either by the proctologist or the general surgeon.

The history of urethral inflammation or stricture is contrasted with the history of cryptitis or hemorrhoids. Dysuria or retention are more likely to indicate periurethral disease, whereas rectal pain and constipation point to involvement of the perirectal tissues. Gross contamination of the urine means major urethral involvement, while mild pyuria may be found in cases of rectal infection with anterior extension.

FREDERICK A. LLOYD, M.D.

Lowmley O. S., and Gentile, A.: Operation for Peyronie's Disease. *J Urol Balt*, 1947 57 152

The operation for Peyronie's disease is done under spinal anesthesia. A tourniquet is placed around the base of the penis and an incision is made on the dorsal surface of the penis, deepened through the skin, subcutaneous tissue, and fascia, down to the fibrous tissue between the corpora cavernosa. The fibrous tissue and associated plaques are dissected free and removed, care being taken to leave as many venules as possible when Buck's fascia is involved in its mesial portion as it usually is. A strip of fat is then sutured in place, care being taken not to approximate the edges of Buck's fascia. This precaution is taken because it has been found that the scar resulting from the healing of one side to the other has reproduced the condition to a certain extent. Therefore, the edges are not allowed to come in contact, one with the other. The tourniquet is released, and necessary pressure is re-introduced if bleeding occurs. The subcutaneous tissue is returned snugly over the fat and the nonapproximated edges of Buck's fascia. This is done with No. 3 plain catgut. The skin is then sutured with silk.

A moderately snug bandage is placed around the penis to create sufficient pressure to ensure hemostasis.

The results are summarized as follows:

"Our experience with operations upon the penis for the cure of Peyronie's disease extends from 1911 down to the present, most of the operations having been done after 1935. Our patients have included men in all decades of life, the youngest being 27 years of age and the oldest 70 years. Our failures have resulted from attempting to operate upon men who

have had too extensive lesions that is areas of in duration extending beyond the summit of the corpus cavernosum on either or both sides.

In the early years of our experience with this disease we operated only upon those patients who had tried every form of nonoperative treatment, but now our results justify operating upon any early case.

JOHN A. LOFF, M.D.

Schrek, R. and Lenowitz, H.: Etiologic Factors in Carcinoma of the Penis. *Cancer Res.* 1947 7 180.

In the present study the authors evaluate the significance of venereal disease, circumcision, age, and race as etiological factors in carcinoma of the penis and illustrate the use of control groups.

The statistical studies with charts and explanations are well presented and should be consulted by the interested reader. They do not lend themselves to condensation. A comparison of data assembled from the clinical and control groups suggests that there are two fundamental etiological factors in carcinoma of the penis: (1) circumcision in early life seems to offer almost complete protection against penile cancer and explains the almost complete absence of the condition in Jewish men; (2) poor sex hygiene appears to be responsible for (a) the high incidence of venereal disease in men with carcinoma of the penis, (b) the relatively greater frequency of carcinoma of the penis in colored men, and (c) the high incidence of syphilis in men with a history of gonorrhea.

The authors found that in the groups with carcinoma of the penis as compared with the control groups there was a high percentage of negroes, a high incidence of syphilis and gonorrhea, a very low incidence of circumcision early in life, and the same incidence of circumcision during boyhood and early manhood. Positive correlations were obtained for the factors indicated as (1) carcinoma of the penis (2) syphilis, (3) gonorrhea, and (4) the colored race. The common denominator in these four factors seems to be poor sex hygiene. It may be concluded that the incidence of carcinoma of the penis could be reduced by early circumcision or by good sex hygiene.

ROBERT O. BEAULIEU, M.D.

GENITAL ORGANS

Dees, J. E.: Congenital Cyst of Prostate. *J. Urol.*, Balt., 1947 57 304.

Dees reports a 26 year old male who was seen because of perineal discomfort and difficult urination. He had a history of intermittent attacks of low back ache treated by prostatic massage which caused the discomfort to disappear immediately. He had been married for 5 years, but no pregnancies had occurred and several studies of the ejaculated semen failed to show spermatozoa. On examination, the right lateral lobe of the prostate was greatly enlarged, soft and compressible. It extended slightly across the midline of the prostate and down over the apex of the gland laterally to the pelvic wall and upward for a short

distance over the base of the bladder. The lateral margin of the left lateral lobe was normal to palpation. Above and to the left of the cystic mass between the rectum and the base of the bladder could be felt several cordlike structures one of which was presumed to be the left seminal vesicle. The expressed prostatic secretion contained from 20 to 30 leucocytes per high power field. The second glass of urine was microscopically negative. Excretory urograms showed a normal left ureter and kidney and no evidence of excretion of dye by a right kidney. Cystoscopy revealed great enlargement of the right lateral lobe of the prostate which displaced the prostatic urethra well across the midline and obscured the entire right half of the trigone and region of the right ureteral orifice. Subsequent cystoscopy demonstrated absence of the right half of the trigone and its ureteral orifice. The left ureteral orifice and trigone were normal.

At operation the prostate was exposed perineally and the large tense bulging right lateral lobe was incised. A cavity was entered which contained 3 ounces of dark fluid. The cavity extended upward toward the region of the right seminal vesicle. The cyst fluid was compatible with normal seminal fluid except that the count was 450 million per cubic centimeter. There was an increase in abnormal forms, and no motile spermatozoa were observed. Subsequently 300 c.c. of air were introduced into the bladder and 20 c.c. of skodan solution were introduced into the cavity through the previously inserted rubber tube. The cavity was lobulated but smooth walled, and 4 cm. in diameter and a tubular structure resembling the right ureter was filled up to the pelvic brim. No suggestion of a renal pelvis was seen. A second irregular tortuous tubular structure was filled, which later turned out to be a redundant right vas deferens. Later the right vas was exposed in the scrotum and injected with skodan. It communicated with the prostatic cyst. The authors relate as follows:

A large cystic cavity occupied the right lateral lobe of the prostate, but did not communicate with the urethra, and both the rudimentary right ureter and the right vas which was dilated and tortuous in its terminal portion, opened into this cavity. Distention and enlargement of the right epididymis were also present.

The findings are explained embryologically as a failure of communication between the wolffian duct and the vesicourethral primordium. Although the ureteral bud developed into a rudimentary ureter its lower end was not absorbed into the developing bladder and urethra, and therefore the ureteral orifice retained its early embryological location in close relationship to the lower end of the wolffian duct.

DAVID ROSENBLUTH, M.D.

Herbut, P. A. and Lubin, E. N.: Cancer Cells in Prostatic Secretions. *J. Urol.*, Balt., 1947 57 542.

To corroborate a clinical diagnosis of carcinoma of the prostate, cancer tissue must be demonstrated

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microscopically. Conventionally, tissue for histologic study is obtained at biopsy by way of perineal exposure by transanal resection, or by removing the entire prostate. In the early stages, however, the former two are not always fool-proof for the biopsy may not be secured from the right spot or the urethral portion of the prostate may not contain the carcinoma. In addition to these methods three other procedures of securing material for microscopic study have been advocated: (1) aspiration biopsy of a nodule suspected of being carcinoma, (2) punch biopsy from a similar area, and (3) the demonstration of cancer cells in urine. Each of these is beset with serious difficulties for both aspiration and punch biopsies preclude the precise localization of the cancer by rectal palpation, and this is open to the objections already cited, whereas the demonstration of cancer cells in urine necessitates exfoliation of neoplastic tissue into the bladder which is a late feature in this disease.

Secretions are secured by digitally massaging the prostate in the rectum, or by collecting on clean glass slides at the meatus they are collected on clean glass slides and smeared evenly and thinly by covering with another slide and are pulled apart and while still wet they are immediately fixed in equal parts of 95 per cent alcohol and ether. They should remain in the fixative for at least 15 minutes, after which they are stained by the Papancolou technique. Stained smears are examined microscopically first with 60 magnification and, if irregular cells are found, with 400 magnification in a systematic manner so that all portions of the slide are inspected. If cancer cells are numerous they may be detected in a few seconds but if they are scanty or absent it takes approximately 30 minutes to examine 6 slides adequately.

In normal hyperplasia, or early cancerous prostate the quantity of secretion varies from 1 to 3 cc. but when the organ has been converted into a stony mass the quantity diminishes to a drop or two. Normally the secretions are opalescent and pearly white or gray. They are unaltered in carcinoma except when the organ becomes hard and it becomes thin watery and of a poor quality.

Noncancerous secretions. Secretions from entirely normal prostates disclose a paucity of cellular elements. The protein precipitates out in the form of minute light green granules. Scattered here and there one finds a few large flat pol. bled or irregular pavement cells that are doubtless derived from the urethral mucosa. Their cytoplasm is abundant light green and sharply defined, and the nuclei are small, round and evenly stained. Prostatic epithelium cells are much smaller than pavement cells. They are single, sometimes in clumps of 2 or 3 polygonal or cuboidal, sharply defined, have a moderate amount of light green cytoplasm, and may not be present in modular hyperplasia. The prostatic epithelium is increased in amount. The cells are usually

a little larger but are otherwise generally the same. Cuboidal cells are sometimes arranged in rows of many as one-half dozen, and at other times polygonal cells of equal numbers may be irregularly clustered together. In each instance the cytoplasm is light green, the cells are regular, and their borders are always sharp and distinct. Sometimes, if considerable pressure is exerted in preparing the smear, the cytoplasm may be considerably drawn out, but even in such cells the same characteristics are not detected. The regularity of the cells is the best illustrated in tissue smears of normal and hyperplastic prostates. In addition to simple cells there are large sheets of polyhedral cells with sharp distinct borders, light green nuclei. In secretions from hypertrophied prostates there are often numerous large central, regular nuclei. In secretions from atrophic and round eccentric nuclei. Concentric, debris cells with reticulated or vacuolated cytoplasm and neutrophils, plasma cells, lymphocytes, and erythrocytes are also present in secretions from prostates with prostatitis. With the exception that both neutrophils and fibrin dominate the picture.

Cancerous secretions. Because carcinoma of the prostate is associated with a normal, hypertrophied or chronically inflamed prostate, the cells in the secretions vary accordingly. In addition to the usual cellular elements, however, some cancerous prostates reveal numerous large flat pavement cells that are all colors of the rainbow. As already noted, these cells are very few in number in noncancerous prostates where they generally stain in light green shades. Aside from pavement cells, all cases of carcinoma have in this series, in which the secretions are disclosed. As might be expected, the latter vary considerably from case to case, depending upon the histologic structure of the carcinoma. But the striking feature is nevertheless, constant enough to enable one to anticipate the type of cancer. In well differentiated adenocarcinoma, smears of secretions usually disclose large or small, solid sheets of cancer cells, close large or rounded, well defined or sharply irregular flat or rounded, well defined or sharply delineated margins. The cell boundaries are almost indistinct or entirely unperceptible. It is scanty fibrin plasma tends to become confluent. It is scanty fibrin, grayish green, oval or round, deeply and evenly stained, and may or may not contain nuclei. The nuclei are relatively large, oval or round, deeply and evenly stained throughout the smears are a few scattered similar single cells with moderate or scanty cytoplasm. In ill-defined and peripherally frayed, cytoplasm. In carcinomas in which irregular cells are not as well defined with large somewhat irregular cells that are not as well defined clusters of cancer cells in the former group. The cells are as dense as the cells in the former group. The cells are spread thinner and are often drawn out into long pointed projections. The cells vary in size but as a rule they are larger than those in the more differentiated tumors. The cytoplasm is abundant although relatively decreased, stainlightly and

is of a blue green or yellowish green color. The nuclei are large, round sharply defined and are rimmed with a distinct membrane. They disclose watery almost vacuolated, lightly stained nucleoplasm and a sharply circumscribed deep blue to black, centrally placed nucleolus. Single tumor cells scattered throughout the smears are essentially similar. Cancer cells in secretions from completely undifferentiated carcinomas likewise vary somewhat from patient to patient. Characteristically however they are found singly if in clusters they are only loosely adherent to each other. The cells are comparatively small, have a moderate or scanty amount of ill-defined, peripherally frayed, yellowish gray or green cytoplasm and relatively large, round or oval, evenly but deeply stained nuclei. In cancers composed of large round, oval or polygonal cells with reticulated or vacuolated cytoplasm, the secretions usually reveal clusters of cells with scalloped margins. The cell boundaries, in contrast to those from other types of carcinoma, are quite distinct. The cytoplasm is reticulated or actually vacuolated, and the nuclei are round or oval and centrally or eccentrically placed. Apart from the aforementioned clear cut types carcinoma of the prostate frequently shows combinations of the various patterns which are reflected almost as clearly in smears of the secretions as they are in histologic sections.

In conclusion, the authors state that a cytologic diagnosis of carcinoma of the prostate from smears was rendered 17 times. The diagnosis was confirmed histologically in 10 cases and was reasonably certain clinically in an additional 6 cases. Some of the patients will be operated upon in the near future. The seventeenth patient has no obstructive symptoms, the prostate was normal on palpation and the patient is being followed closely for further developments. A diagnosis of carcinoma from an examination of smears was not rendered in 1 case histologically proved, and in 1 clinically evident case of cancer. In each of these the secretions were scanty and of a poor quality.

JOHN A. LOPEZ, M.D.

Blauert, J. E., and Emmett, J. L.: Transurethral Resection for Postoperative Urinary Retention. *J. Urol. Balt.* 1947 57 771.

When one is confronted with the usual case of urinary retention following surgical removal of the rectum and sigmoid it goes without saying that every means should be tried to establish normal micturition before transurethral resection is advised. When 3 or 4 weeks have elapsed after operation and the patient is still unable to void satisfactorily and a large residue remains, the problem demands more serious consideration. The surgeon must then decide whether to continue with indwelling or intermittent catheterization for several weeks or months hoping that vesical function will eventually be re-established, or whether to relieve the patient quickly of his trouble by transurethral resection. Because transurethral resection in these cases involves little or no risk to the patient causes no discomfort and

will eliminate the vesical dysfunction and residual urine promptly in well over 90 per cent of the cases, it is the authors' opinion that, when indicated, it should not be postponed longer than 4 weeks after operation unless the patient's general condition is not satisfactory. It is not necessary to perform a preliminary cystoscopic examination on the patient to decide if resection is indicated. Whether the condition is a simple contracture or fixation of the vesical neck or adenomatous hyperplasia, transurethral resection if completely done will eliminate the residual urine and establish normal micturition.

In the original paper on this subject, by Emmett and Cristol 33 cases were presented in which transurethral resection had been performed after operations on the rectum and sigmoid. These cases were encountered at the clinic in approximately a 10 year period which ended with January 1944.

The authors thought that it would be instructive to study this subject again by analyzing the cases in which transurethral resection had been done since the original report. Among other things they were interested in determining the approximate incidence of patients who came to transurethral resection following surgical removal of the rectosigmoid. Accordingly they reviewed the 34 cases in which the operation was performed during the 2 year period from January 1 1944 to January 1 1946 inclusive. These constitute approximately 3 per cent of the cases in which the rectum sigmoid or both were removed at the clinic during this period.

The largest number of operations performed on the rectum and sigmoid were one-stage combined abdominoperineal resections. None of the patients was less than 50 years of age, most of them were more than 60 years of age. At least 4 weeks were allowed to elapse in most cases. This was done for two reasons: first to allow the patient a sufficient time for recovery between the two operative procedures and second, to give the bladder a chance to re-establish its normal function spontaneously. The amount of tissue to be removed in most cases is rather small (15 gm. or less). The results of the transurethral resection in these cases are classified as follows: excellent, 30 fair 2 and poor 2. Contrary to general opinion good results in transurethral resection are not secured most easily in cases in which the patients have small prostates (weighing less than 10 gm.) but rather they are obtained when the prostates are of moderate size (weighing from 40 to 60 gm.)

Valério, A.: The Surgical Treatment of Hydrocele (Tratamento cirúrgico de certos hidroscies vaginais) *Brasil med.*, 1947 61 55.

In 1,468 cases of hydrocele of the testis or the spermatic cord the author employed injections of sclerosing substances. Under local anesthesia the contents of the hydrocele were aspirated and from 1 to 5 c.c. of Lugol's solution 90 per cent alcohol iodine solution phenol ether and iodoform, corrosive mercury of bicloride solution formalin quinoline

GENTOURINARY SURGERY

During the acute stage there is considerable edema of the mucous membrane of the bladder with a great tendency toward bleeding so the cystoscopic study is both difficult and ill advised. It is ill advised since the possibility of inducing an epididymitis is great. The characteristic picture in this stage is edema, and in 2 instances the patients were referred to the author because it was thought that they had bladder tumors.

In the subacute phase the characteristic lesion is an edematous plaque of plum colored mucosa. In the central portion of this area a slough develops and the central ulcer results. The trigone seldom seems to be involved in this stage but the ureteral orifices are frequently involved and this accounts for the not infrequent subepithelial round cell infiltration.

The healing stage occurs by the resolution of the frequent subepithelial round cell infiltration. The edematous areas and areas of inflammation or appears, in bladder shows areas of inflammation or appears, in the words of the author as though it had been splashed with small drops of red paint.

The use of novarsenobion is specific for this condition and the healing process under this therapy occupies less than a fortnight. There is apparently no residual scarring and almost immediately after the institution of this therapy the bladder becomes insensitive and the reduced vesical capacity rapidly increases.

The subjective signs of this condition are those of vesical irritation and reduced bladder capacity with pyuria and hematuria. The vesical pain is out of proportion to the degree of frequency. Fever, increased pulse and toxemia are notable by their absence.

In all the cases reported there had been a history of recent sexual contact and with the exception of 3 often had had a urethral discharge. The discharge was watery in character.

Nine cases of nonspecific epididymitis were reported and of this group 4 were treated with novarsenobion with immediate relief. The swelling subsided with great facility. ROBERT LICK, JR. M.D.

Goldstein A. E. and Rubin S. W. : Reiter's Disease followed by True Infective Abacterial Pyuria. *Brit. J. Urol.* 1947 19 33

The author reports a case of simultaneous Reiter's disease and infective abacterial pyuria.

There has been no etiological agent established for Reiter's disease with its triad of urethritis, arthritis and conjunctivitis. Nor has the etiological agent responsible for abacterial pyuria been determined although it has been shown repeatedly that the arsephenals are therapeutically specific.

The case presented was that of a 35 year old male who had a urethral discharge 8 days after sexual intercourse which was found not to be due to the gonococcus. Sulfonamides did not afford any relief and 3 weeks after the onset of the urethral discharge an incapacitating swelling of the right knee and

ankle was noted. A week later a purulent conjunctivitis developed. The latter cleared with penicillin and sulfonamide medication but the arthritic and urethral symptoms remained.

After 5 months the symptoms began to subside and at this time the patient claimed marked improvement. At this time the patient claimed marked improvement. At this time the patient claimed marked improvement. At this time the patient claimed marked improvement.

The physical examination demonstrated little urgency, frequency, nocturia, dysuria, and hematuria. The physical examination demonstrated little urgency, frequency, nocturia, dysuria, and hematuria. The physical examination demonstrated little urgency, frequency, nocturia, dysuria, and hematuria.

The urine examination was essentially normal except for pus blood and the presence of staphylococci on direct smear. Intravenous pyelography was without significant findings although both ureters were slightly dilated. Cystoscopy showed a markedly injected mucous membrane of the bladder particularly in the right and left anterolateral portions along with ureteral orifice dilatation. The kidney urines as obtained by ureteral catheters were found to be free of blood and pus.

The administration of 40 mgm of napharsen resulted in immediate symptomatic improvement and 2 additional injections were given at weekly intervals. The patient was asymptomatic during the 6 months prior to publication of the original article. The author briefly discusses the treatment of Reiter's disease and abacterial pyuria and reviews its etiological possibilities. ROBERT LICK, JR. M.D.

Adcock, J. D. and Plumb, R. T. Urinary Tract Infections. *J. Am. M. Ass.* 1947 133 579

Streptomycin has been shown to be effective in vitro against various gram negative bacilli frequently responsible for urinary infections which prove refractory to sulfonamide compounds and penicillin. The purposes of this article are (1) to report the results of streptomycin therapy in 21 patients with infections of the urinary tract due to gram negative bacilli which were sensitive to streptomycin in vitro (2) to correlate results of in vitro sensitivity and the concentrations of streptomycin in the patients' serum (3) to report the acquisition, in vivo of definite resistance to streptomycin.

The results of streptomycin therapy were most impressive in 5 patients with chronic infections due to organisms of the *Acetobacter* group. There was prompt relief of symptoms, pyuria disappeared, and urine cultures became sterile. These effects persisted after streptomycin therapy was discontinued.

The 5 cases in which in combination with other organisms, responded less satisfactorily. In each case pyuria diminished or disappeared with acute episodes rarely rapidly declined in the cases with acute episodes. The *Pseudomonas aeruginosa* was, however, constant ly present in urine cultures following therapy. In a case of chronic cystitis due to *Escherichia coli* temporary relief of symptoms and diminution of pyuria occurred but the bactericidal effect was obtained when the concentration of streptomycin in the serum

was approximately 10 or more times as great as that required for inhibition of the infecting organism *in vitro*. However the effect appeared to be merely bacteriostatic against the more resistant organisms in cases in which the sensitivity of the infecting organism more nearly approached the concentrations attained in the serum. The demonstration that the concentration of streptomycin in various tissues is far below that found in the serum may help to explain these relationships. Although streptomycin appears in the urine in high concentration it is doubtful that this is of importance in therapy since in an established infection there must certainly be invasion of tissue as well as infection of the urine itself.

Among the bacteria isolated following therapy three organisms apparently acquired an increased tolerance to streptomycin. In 1 case a strain of the *Pseudomonas aeruginosa* recovered just prior to therapy was inhibited *in vitro* by 4 mu gm of streptomycin while the strain isolated after 4 days of treatment required 200 mu gm for inhibition. In the same patient a strain of the *Streptococcus faecalis* which was initially present was inhibited by 20 mu gm but after 4 days of treatment it grew well in 1 mgm. Similarly a strain of the *Escherichia coli* was sensitive to 1 mu gm and after 5 days of treatment it grew in 1 mgm.

Should this phenomenon prove of frequent occurrence the size of the initial dose of streptomycin will be of extreme importance and if a bactericidal effect is to be obtained it must be obtained promptly.

G. EDWARD A. LLOYD, M.D.

Pool, T. L., and Cook, E. N.: Urinary Tract Infections. *J Am Med Ass* 94:7 33 194.

Two important factors must be considered in the management of infections of the urinary tract. The first is the coexistence of other pathologic processes in the urinary tract.

It was observed early that the presence of obstruction, tumor, stone or marked chronic inflammatory changes in the urinary tract definitely reduced the efficacy of the ketogenic diet in the eradication of urinary infection but when none of these pathologic processes were present the result of treatment with the ketogenic diet were much better. Exactly the same observations were made when mandelic acid, the sulfonamides, penicillin and streptomycin were used. The other factor is the variation in the results obtained with the various strains of organisms. This definitely suggests the importance of using various therapeutic compounds in alternate courses if one or another fails to eradicate the infection. Of course there is no use to do this if coexisting pathologic conditions have not been removed first of all.

For the routine treatment of infections of the urinary tract, mandelic acid and the sulfonamides are still the drugs of choice. Penicillin is a great adjunct to treatment but it has not been the boon we had hoped for in the ordinary case of non-specific infection of the urinary tract. Streptomycin produces spectacular results in some cases of resistant

urinary infection but cannot be used routinely at the present time. Our studies concerning this drug are incomplete because the supply has been so limited that it has been impossible to carry out the investigative work that should go along with the study of any antiseptic.

Donovan, H.: Care of the Urinary Tract in Paraplegic Patients. *Lancet* Lond., 947 53.

Donovan treated 82 paraplegic soldiers in a regional spinal unit. Almost all of them had had a high suprapubic cystostomy. The tubes were changed weekly. A No. 28 Malecot type connected to a leg bag is preferred. Tidal drainage was employed enthusiastically at first but the author concluded that the urines were more cloudy and pyrexial attacks were commoner with all methods of bladder drainage other than the direct simple one of leading the suprapubic tube into a bedside bottle.

After trying many solutions, the author settled upon a 5000 neutral proflavine solution as an emptying medium. The bacterial flora were constant, consisting of the *Bacillus coli*, *Streptococcus faecalis*, *Bacillus proteus* and *Pseudomonas pyocyanea*. It was found that penicillin was the best drug for reducing a pyrexial attack. Ammonium chloride (60 gr. daily) was the best routine urinary antiseptic, and the pH of the urine was kept at 5. Pyelography was carried out to exclude an obstructed upper urinary tract for unexplained fever lasting 3 days or more. During these attacks the urine from the bladder was almost always infected although it might have been clear to the naked eye.

A patient with an intact micturition center in the cord can often develop satisfactory automatic micturition with sufficient warning to enable him to dispense with an incontinence apparatus. When the bladder is closed the urine usually becomes much cleaner and the flora become simplified. Once the bladder has been satisfactorily closed pyrexial attacks may cease and the patient's morale is greatly improved. However, if he is completely bedridden, as with a low cervical lesion, nursing is easier with a suprapubic tube. In deciding whether the patient can achieve automatic micturition, the author looks for the following signs: (1) Does urine pass during bladder lavage or obstruction of the suprapubic tube? (2) Does the patient pass urine and empty the bladder during cystometrograms studies at any reasonably low pressure? (3) Do the muscles of the legs respond to faradism?

About one third of the patients developed calculi. In every case the renal tract was always roentgenographed every 3 months and an intake-output chart was kept. The patient's position was frequently changed, a high acid-ash diet was employed, and the urine was kept at a pH of 5 with ammonium chloride. In 30 per cent of the patients, renal or ureteral calculi were found. There was no apparent connection between the stone formation and the level of the paralysis. Recumbency was probably a major factor in causing stones and urinary tract infection.

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was an important accessory cause. Stones were observed to form rapidly in a matter of weeks.

Cystometrograms were made but were not of great practical value as they did not show the site of the lesion or the degree of functional recovery. Excretory urograms demonstrated that no dilatation took place as long as the bladder was drained although dilatation of the upper tract is much more likely with cauda equina lesions than with spinal cord lesions. In the former the ureter can dilate extremely even after a few hours of retention.

DAVID ROSENBLUM, M.D.
J. Urol

Roth A. A.: Familial Eunuchoidism
Balt. 1947 57 447

The author studied 4 brothers who presented a marked hypogonadism on examination by the following tests: biopsy of the testes and mammary glands, x rays of the skull, frontal sinuses, and chest, excretory programs, assays of urinary gonadotropins and 17 ketosteroids, determinations of the blood cholesterol, blood urea nitrogen, glucose tolerance study and phosphorus, urinalysis, blood counts, study of the basal metabolism rates, and the blood pressure and Klinefelter's. Ophthalmological checks and psychometric studies were also carried out on each patient. The first patient was 55 years old. The outstanding findings in his case were infantile sex organs, retinal degeneration with rotatory nystagmus, unsteady gait with wide base and marked arthropathy of the left knee. The testes were small and microscopic studies showed the tubules to be small and papillated with Sertoli cells. Some tubules contained spermatocytes to severe in the tubules. The fibroblasts were increased. No Leydig cells were seen.

The second patient was 52 years old. He presented marked infantile sexual structures, retinal degeneration, rotatory nystagmus, scanning speech, and eunuchoid proportions. Testis biopsy was similar to

that of case 1. There were also hypoaesthetic reflexes and adiolococness of the right arm and asynergy major. The third patient was 49 years old and presented marked infantile sexual organs, extreme obesity, retinal degeneration with rotatory nystagmus, large breasts, generalized hypotonia, asynergy major and adiolococness of both arms. Testicular biopsy was similar to that of case 1. There were no germinal cells present, many tubules were completely hyalinized and no Leydig cells were seen.

The fourth patient was 47 years old and presented eunuchoid proportions, sexual infantilism, gait disturbance, and visual difficulties due to retinal pigmentation and rotatory nystagmus. Testicular biopsy was similar to that in case 1.

The appearance of the testes suggested that spermatogenesis had never occurred and this was interpreted as being due to a long standing lack of pituitary gonadotropins. The atrophic appearance could be secondary to failure of development from an infantile state.

The 17 ketosteroids in all 4 individuals were markedly diminished, as were the urinary gonadotropins. Cases 3 and 4 were treated for 40 days with chorionic gonadotropin and pituitary gonadotropin with no results and it was concluded that the testes were incapable of responding to such stimulation. All cases were treated with testosterone which resulted in increased pubic hair, voice change, increase in the size of the sexual organs and improvement in the gait and muscle tone.

The author concludes that long standing degeneration of the anterior pituitary gonadotropic hormones can produce gonadal failure and the resulting adipose genital dystrophy observed in these cases. In addition, there is probably partial adrenocortical failure secondary to lack of adrenotropin. The article includes remarks concerning the hereditary aspects of this so-called syndrome.

ROBERT O. BRADLEY, M.D.

SURGERY OF THE BONES, JOINTS, MUSCLES, TENDONS

CONDITIONS OF THE BONES, JOINTS, MUSCLES, TENDONS, ETC.

Alarcón, F O : Penicillin and Osteomyelitis (Penicilina y Osteomielitis) *Rev As med. argent* 1947 6 5

The author believes that osteomyelitis and osteitis develop from inoculation via the blood stream, from an exogenous source or from a small contiguous infectious focus. He believes that penicillin has definitely lowered the mortality rate and the number of complications, but reserves his opinion regarding a total cure and the possibility of sterilizing a focus.

The doses should be large parentally and locally. If there is no tendency toward resorption of the sequestra resort to surgery is indicated. Abscesses should be drained.

Osteomyelitis is never cured if there is an elevated blood count and in chronic osteomyelitis, penicillin therapy should accompany the Orr treatment. Surgery should not be omitted when penicillin is used rather the latter is an auxiliary to surgery particularly when a compound fracture is present.

STEPHEN A. ZIEGLER, M.D.

Goesseco A. Von Recklinghausen's Generalized Osteitis Fibrosa Cystica and Epithelioma of the Breast. Difficulties of Diagnosis (Osteite fibro-géodique généralisée de Recklinghausen et épithélioma du sein). *Rev. chir. Par* 1946, 38 359.

Von Recklinghausen's disease treated and cured by parathyroidectomy is still sufficiently rare to warrant the presentation of a case of parathyroid osteitis associated with cancer of the breast.

A 38 year old female was admitted to the hospital with pathological fractures of both femurs and paralysis of the lower extremities associated with severe pain. The patient had pain first in the right leg, then in both legs and the right shoulder for the last 15 years. She consulted many physicians who treated her for rheumatism. Five years later she was forced to use a cane when walking. At that time a positive blood Wassermann reaction was discovered and for the following 2 years she received antisyphilitic treatment without effect on the pain in her bones. Ten years after the onset the patient was bedridden. She had to be hospitalized for 5 days because of a hepatic crisis. About a year later she sustained a fracture of both femurs associated with little pain. Six months later she sustained another spontaneous fracture of the right femur and soon afterward a fracture of the right clavicle. At this time there was complete lack of control of the lower extremities, generalized amyotrophy, and pronounced myasthenia. There were also old ununited fractures and recent fractures which were not accompanied by any

discomfort. Roentgenological examination showed generalized decalcification especially of the pelvis, spine, femora, and clavicle. There was some periosteal reaction in areas where the cortex seemed to have disappeared. There were cavities observed in the shafts and epiphyses of the long bones which gave the bones a polycystic appearance. The fracture fragments were overriding and there was no trace of repair.

There was slight hypotension, slight anemia, and a positive blood Wassermann reaction. The blood calcium ranged from 10.50/100 to 12.00/100 (Ward method), and the phosphatase was elevated to 900/100 (Janner Kay method). The urine calcium was somewhat above normal 0.46 per cent, and the phosphorus, 1.73 per cent. The Bence Jones albumin was negative.

There was hypertrophy of the thyroid, this organ being the size of half a lemon. Exploration of the area revealed a true enlargement of the gland. The hypertrophy of the thyroid gland dated back to the onset of the patient's skeletal complaints. The right breast showed a small scar the result of a biopsy about 6 months prior to the patient's admission to the hospital. The biopsy revealed an epithelioma. The regional lymph glands were not involved. The patient refused mastectomy at that time.

A diagnosis of generalized osteitis fibrosa cystica (von Recklinghausen) was made but the possibility of bony metastases from the epithelioma of the breast could not be ruled out definitely. It was therefore decided to perform a thyroidectomy. Histological examination of the excised right lobe showed masses of parathyroid cells imbedded in the thyroid tissue.

Twenty one months after the operation the general condition of the patient was greatly improved. There was gain in weight and the "bone pains" and anorexia completely disappeared. The pathological fractures were solidly healed but misaligned because of the fact that the patient removed the plaster casts after a month and a half. The X-ray examination showed considerable bone changes. The contour of the bones as well as their density was nearly normal. There was still some evidence of cysts in the shafts but the cysts were much less distinctly outlined. There was no change in the blood chemistry. The Chvostek sign was slightly positive, the Trousseau sign negative. There was regional glandular involvement of the breast cancer. Mastectomy was now performed.

GEORGE L. KIRBY, M.D.

Fossum, F : Roentgenological Considerations of a Rare Osteoarthropathic Syndrome (Considerazioni radiologiche su di una rara sindrome osteoartropatica). *Radiol. med. Milano*, 1947 35: 1.

The author reports a case of a female 47 years of age in whom symptoms of pain in the lower extremities started at the age of 11 and gradually became more manifest at the age of 16, when motion be-

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came limited. This pain was accentuated at the beginning of menstruation but was never accompanied by fever. At first the pain was more or less localized in the knee then it spread to the shoulder, elbow, wrist and feet in the given order. Within a year's time at the age of 21 the patient experienced ankylosis of all her joints and was not able to assume the erect posture eventually becoming bedridden. Pain at the beginning was great but it gradually diminished and finally disappeared while the ankylosis increased and spread to the feet, legs, and vertebral column.

The roentgenograms were characterized by numerous ankylosing foci of alterations of various sizes these were symmetrical osteolytic processes in the epiphyses and diaphyses. There was concentric atrophy in the region of the diaphyses and ankylosis of the large and small articular surfaces.

This condition must be differentiated from primary ankylosing chronic polyarthritis neurogenic osteopathies myelodysplastic localized cryptogenic foot (described by Kienboeck) localized cryptogenic osteolysis scleroderma Raynaud's disease the acromioclavicular and Blum's osteoarthritis pathic microstrophic.

ARTHUR F. CIPOLLA, M.D.

Umansky A. L. Schlesinger P. T., and Greenberg. B. B.: Tuberculous Dactylitis in the Adult. *Arch. Surg.* 1947 54 67.

Tuberculous dactylitis in the adult is a rare disease. It is relatively common in children. The disease involves the phalangeal bones of the hands. Because of its bony deformity it is called spina ventosa.

The authors' case report of a 19 year old negro is accompanied by 4 roentgenograms and an excellent clinical discussion. The patient was seen first by the authors in March 1941 with tuberculosis of the wrist. Two months later a fusiform, painless, progressive swelling of the finger in 1942 roentgenograms of the periosteum and cortical involved. Roentgenograms of the proximal phalanx of the left index finger soft tissue about the bone also showed an elevation of the proximal phalanx of the left index finger. A second roentgenogram of the proximal phalanx of the left index finger was taken in September 1943 because of persistent pain and swelling. This revealed rarefaction of the proximal phalanx of the left index finger with expansion of the bony cortex, or the so-called spina ventosa.

A fortnight later the patient reported for further observation. In addition to the previous roentgenologic manifestations alluded to, he had sustained a pathologic fracture of the affected finger. Despite the patient's condition he passed a month later examination, only to be discharged to the outpatient department. In 1944 he returned to the outpatient department where after a thorough examination the authors performed an amputation of his left index finger. Histologic examination revealed typical Langhans giant cells in the tubercle mass.

The differential diagnosis, according to the authors, should include (1) syphilitic dactylitis which is polystotic, (2) enchondromas (3) osteitis, (4) Boeck's sarcoïd (5) coccidioidomycosis (6) leprosy (7) yaws and (8) osteomyelitis.

Tuberculous dactylitis in children differs from that in the adult in that in the former the disease is concomitant with other organic disease, whereas in the latter the malady is not a part of a generalized process. Moreover fistula formation is the rule in children but no fistulas are found in adults. Amputation is the treatment of choice.

SAMUEL L. GOVERNALL, M.D.

SURGERY OF THE BONES, JOINTS, MUSCLES, TENDONS, ETC.

Outland, T., and Corn O.: The Use of Parallel Grafts and of Two-Stage and Three-Stage Interlocking Grafts in the Treatment of Idiopathic Scoliosis. *End Results in 41 Cases.* *J Bone Surg.* 1947 29 103.

The greatest need in severe or progressive scoliosis is not a method of correction but the maintenance of the correction. In a large series of cases correction was attained in 61 per cent, but pseudarthrosis occurred in 28 per cent. Delayed fusion occurring after most of the correction has been lost is a problem which must also be solved. The authors present a method of fusion designed to improve the results in this regard for short curves (5 to 7 vertebrae) rigid tibial

For short curves (5 to 7 vertebrae) rigid tibial grafts are placed on both sides of the spinous processes. In longer curves the grafts are lapped at the middle to give maximum strength at that point (two-stage interlocking graft) For the very long fusions a three-stage interlocking graft is used. This is applied by putting the first graft along one side of the spinous processes the second graft on the other side and the third graft on the original side each graft overlapping by at least a vertebrae. The lateral articulations are not attacked but the grafts are laid subperiosteally against the spinous processes and laminae and the spinous processes are undercut and turned upside down to come into close contact with the graft.

Among the 41 cases of idiopathic scoliosis in this series there was no mortality and only 3 (7.3%) fractures of the graft occurred. One patient fractured the donor tibia and another developed a mild infection in the donor leg. There were other complications not related to the surgery.

The scoliosis with a double primary curve is disallowed. The authors favor correcting both curves as far as possible with a Risser jacket hinged at two levels. The thoracic curve is corrected first then the lumbar. The whole area is then fused.

The final results shown in the series presented (43% improvement) are much better than the results given by the Research Committee of the American Orthopedic Association (25% improvement). The authors warn against the danger of persistent conservative methods without accurate and frequent

measurements by means of x rays. These methods should certainly not be continued until a mild curve becomes moderate or severe.

The Risser jacket was the most effective method of correction of the severe curves. In a less severe case the Lemesuner hammock suspension afforded excellent correction.

Some good x rays and photographs are reproduced to illustrate the various points of this article.

NEWTON C. MEAD, M.D.

Menzari A. Cure of the Postpoliomyelitic Flexion Adduction Deformity of the Hip (Sulla cura dell'anca flessa-abdotta poliomielitica). *Chir. org. modic.*, 946 30 383.

Three types of postpoliomyelitic contracture about the hip are described: the flexion adduction contracture, the surgical correction of which the author discusses; the flexion adduction contracture and the mixed forms of contracture. Of these the first is the most common. Most of the efforts to prevent the flexion adduction type of contracture with outward rotation at the hip and consequent obliquity of the pelvis to maintain the erect position of the body are rendered fruitless by the young child's habit of flexing the hip in sitting and walking on all fours. Other methods have been proposed to correct the paralysis of the adductors and flexors of the thigh. However no method has been devised against the outward rotation contracture and no method has been devised which tends to establish a functional counteraction against a possible recurrence of the original deformity. The author's method, which he believes to be original with himself, consists essentially in detaching the sartorius and tensor fasciae latae muscles at their proximal attachments and transferring them medially by means of subcutaneous tunneling to a new attachment on the pubic tubercle. Thus the sartorius becomes an adductor and the tensor fasciae latae muscle an inner rotator and after re-education they assume an active role in correcting the abnormality and guarding against recurrence.

The method has been employed by the author in 25 children from 7 to 14 years of age: the first time in 1934. Judging from the patients who were operated upon sufficiently long ago, the pelvofemoral position is found to have been corrected and there is no tendency toward recurrence. Both functionally and esthetically the author considers the results to be sufficiently encouraging to justify his reporting them at this time.

JOHN W. BRIDGES, M.D.

Murray C. R.: Treatment of Injuries to the Knee Joint. *A. England J. M.* 947 230 203.

Stabilization of the knee joint is accomplished not by various ligaments but by the co-ordinated action of the surrounding muscles. Any injury to the intra-articular portion of the knee joint is associated with a rapid hypotonia that is relatively selective for the extensor mechanism of the joint.

If examination, which should always be done with the thighs thoroughly exposed, shows there is no

visual palpable or measurable hypotonia or simply of the thigh, there is probably no lesion involving the knee joint and it can be assumed that the lesion lies outside of the joint. If there is hypotonia and atrophy of the thigh muscles soon after injury, the pathology lies within the joint.

Whenever a knee joint develops fluid within a matter of hours after injury, the condition is blemarthrosis and not traumatic synovitis.

Range of extension is a primary consideration. With the heel resting on the examiner's knee, the knee should completely extend. If it does not, muscle spasm or mechanical block is the cause. Spasm may be secondary to fluid in the joint.

Flexion due to spasm and fluid can be overcome by steady pressure, but on release of the pressure the knee rebounds into flexion. Normal knees do not rebound. If, because of the severity of pain or mechanical obstruction, the joint cannot be straightened, there is probably a mechanical derangement of the knee joint.

Spurting of the ligaments, when not accompanied by blemarthrosis, are not accompanied by rapid hypotonia and loss of thigh contour. If there are actual ligament tears they are evidenced by abnormal mobility of the joint in full extension.

Cruciate tears are less important than collateral ligament injuries. They rarely require surgical repair and should be treated by restoring the quadriceps mechanism.

The diagnostic feature of meniscus injury is a sudden, twisting effort, with the knee flexed, that results in localized pain on the inner or outer side of the joint, often followed by a sudden accumulation of fluid (blemarthrosis) and tenderness at the site of pain, and there may or may not be locking. A locked knee must be unlocked before it is immobilized. As manipulation should be done under an anesthetic, the method of reduction consists in first flexing the knee and hip to right angles. The tibia is rotated loosely inward and outward on the femur and then adducted and abducted. Following this the knee is brought into sudden extension.

The author believes in radical surgery if there are signs of a meniscus tear even if the joint is not locked. This should not be done for a first injury, however. Perfect results are not always obtained from surgery.

The patients with meniscus injuries in whom operation is not performed should be treated by placing the knee in an extension cast and made to walk without crutch or cane so as to develop the thigh by co-ordinated muscle activity. When this is not possible the quadriceps contraction exercise, a poor substitute, must be used. The cast is worn about 4 weeks, after which normal function is started. The patient is taught to forget flexion but to develop extensor power.

Immobilized joints become stiff because of a loss of elasticity and thickening of the capsular structures. This is the result of loss of minute circulatory efficiency due to absence of normal muscular activity. The joint does not have to move to remain healthy.

SURGERY OF THE BONES JOINTS MUSCLES TENDONS

but the muscles must be kept moving if the minute circulation of the part is to approach normal.

The author believes it is impracticable to make a clear cut and definite preoperative diagnosis in cases of internal derangement of the knee joint. He explores the joint thoroughly through a long incision without a tourniquet with the patient in a high Trendelenburg position. The parapatellar incision extends from the upper limit of the suprapatellar pouch to the tibial margin. Only 30 per cent of a series of 400 patients with internal derangements had meniscus injuries alone. Another 30 per cent had some other lesion such as torn crucial ligament or a synovial or fat pad lesion in addition.

Postoperative care is not complicated by the long incision. The joint is kept moving but no violent or forced exercises or exercises to fatigue muscles or beyond pain limits are permitted. Immobilizing the knee postoperatively may result in stiffness of the joint and should not be done. The more exercise undertaken by the muscles activating the knee joint within physiological limits the better off the patient when an injury to the meniscus and the joint is again under conservative treatment and the joint is again injured several months later the same conservative treatment is not repeated. A tear limited to the meniscus will never heal but it usually heals if it is in the ligamentous structures uniting the meniscus to the margin of the tibia. Recurrent injuries may be assumed to be tears through the cartilage which have not healed. Operative treatment is indicated. It is not wise to wait for multiple recurrences as these damage the articular surfaces.

Discussion of this article brought out several more points among them that the author routinely removes the fat pad when he operates upon mechanical ly deranged knees.

NEWTON C. MEAD, M D

Parker J.M. and Modlin J J Compound Injuries of the Knee Joint *Ann. Surg.* 1947 125 341

Early exploratory arthrotomy was found to be the treatment of choice in compound injuries of the knee joint. This observation is based on approximately 300 compound injuries of the knee joint treated in the Mediterranean and European theaters of operation. In the forward hospitals arthrotomy of the injured knee joints was carried out at the earliest possible time. Any intra-articular loose or foreign body was removed. The synovial membrane was closed. The soft parts were debrided but not sutured. Penicillin was administered intra-articularly and followed up by parenteral injections. The extremity was then immobilized in a hip spica or Tobruk plaster cast.

This article is chiefly concerned with the treatment of joint injuries at the base hospitals. The general condition of the patient is rapidly brought to a state in which further operative treatment is removed for the operating room the dressing is removed for the first time since its application. The uninfected knee will have diminished but painless motion. The pa-

tient is then anesthetized. Any excess intra-articular fluid is aspirated and cultured. Gentle irrigation of the joint cavity with saline solution is carried out. Should arthrotomy be indicated it should be carried out with the use of a tourniquet. Twenty thousand units of penicillin in from 10 to 30 c.c. of saline solution are instilled into the joint cavity. The skin is then closed.

The usual uncomplicated knee injury is immobilized with traction for from 5 to 7 days. Systemic administration of penicillin is continued. In cases with favorable response the intra-articular effusion per articular swelling and elevated temperatures disappear within 2 or 3 days. Early mobilization and exercises are very important in the after-care of clean wounds of the knee joint. Quadriceps atrophy and the formation of adhesions in the joint are prevented.

More than two-thirds of the injured knees were complicated by fractures of the condyles or the patella. Total patellectomy is indicated in severely comminuted fractures of the patella. In cases in which a major fragment with a good articular surface remains, it may be left *in situ* after excision of the smaller comminuted fragments.

Condyles usually show only minor fractures i.e. penetrating injuries chip fractures or incomplete fractures. Any muscle should be removed when at all possible. It may be hidden under portions of elastic cartilage which have retracted and in regularities of the condyles are smoothed down and loose fragments are removed. Severely comminuted fractures of the condyles are treated with skeletal traction or plaster immobilization to await solidification of the fragments. Fusion at a later date usually is necessary.

Loss of the soft parts around the joint often makes it impossible to approximate the wound edges. In cases in which the cartilaginous and bony portions of the joint are intact early plastic repair of the wound should be carried out. This can be accomplished by swinging a wide based pedicled flap over the defect or by shifting undercut adjacent skin over the soft tissue defect.

It was definitely established that compound injuries of the knee joint due to shell fragments showed a much higher degree of infection than those caused by bullets. Therefore even a highly shattered joint caused by a bullet should be treated conservatively since it is not likely to become infected.

Accurate data were compiled concerning 244 patients with compound injuries of the knee joint.

GEORGE I. REESE, M D

FRACTURES AND DISLOCATIONS

McCarroll H. R. I. The Use of Small Threaded Wires in the Treatment of Fractures Fractures of the Upper Extremities. *Arch. Surg.* 1947 54 154

The author advocates the use of the threaded wire in fractures of the clavicle dislocation of the acromioclavicular joint and fractures of the proximal end of

the humerus, particularly when the tuberosities are displaced. The surgical or the anatomic neck of the humerus may become badly displaced. As a rule open reduction may be carried out through a small incision anteriorly and adequate approximation of the two fractures can be maintained by the use of 2 threaded wires drilled through the tuberosity and into the medullary canal of the distal fragment. If there is any fear of the wire's wandering farther into the medullary canal this can be easily prevented by the application of a nut to the projecting portion of the threaded wire.

The wires are also used for fractures of the epicondyle of the humerus with displacement. These fractures usually require open reduction. The fragment is held firmly in place with a towel clip and a small threaded wire is drilled through the fragment and into the humerus. This affords excellent fixation. This wire is cut off flush with the surface of the epicondyle and is not removed. Plaster fixation of the extremity is necessary for from 6 to 8 weeks.

The wires are also useful in fractures of the olecranon. If such fractures are displaced open reduction is indicated. In this way the contour of the articular surface can be restored and the interposed periosteal flap, so frequently stripped from the cortex at the time of the fracture, can be removed which facilitates accurate reduction and apposition of the fragments. This is done through a small overlying incision the fragments are reduced and realigned exactly as in a jigsaw puzzle and are held firmly in place with a towel clip. A threaded wire is then drilled through the fragment and into the ulnar shaft.

In fractures through the neck of a metacarpal with angulation of the metacarpal head to the flexor surface a wire is passed through the distal fragment and into the medullary canal of the metacarpal, after accurate open reduction. A small incision is placed along one margin of the involved metacarpal. The wire is inserted through the distal fragment at the margin of the articular cartilage in order to disturb the structure of the joint as little as possible. In fractures of this nature the wire is always allowed to protrude and it is removed in 4 weeks. No external fixation is needed and this permits early institution of active and passive exercise in these hands, an all important factor in preserving function.

C. FRED GORDON, M.D.

McCarroll H. R.: The Use of Small Threaded Wires in the Treatment of Fractures. Fractures of the Lower Extremities. *Arch. Surg.* 947 54 35.

The author advocates the use of small threaded wires in the treatment of fractures of the lower extremities. Such a wire affords excellent fixation and it causes a minimum amount of trauma to the bone and soft tissues compared to other forms of internal fixation. Screws are too large for fixation of small fragments and often result in their comminution. The smooth Kirschner wire does not hold as well. The threaded wire combines the desirable features of the two and it is by far the most ideal aid

The Kirschner type of wire and traction bow has always seemed objectionable first, because the bow rested across the front of the leg below the knee and thus made it impossible to place the knee in complete extension when desired and second, because there was invariably a tendency for lateral play of the wire through the extremity and this resulted in some infections. Wires of this type and the bows from the leg lengthening apparatus were used for ordinary skeletal traction in many cases.

This method has been used over a period of 10 years for skeletal traction in several hundred cases. The method has proved satisfactory in every respect. With the threaded wire no tendency for the wire to wander has been encountered. When the wire is used for fixation of heavy cortical bone, however, as in transfixation of the fragments of spiral or oblique fractures of the long bones, it has been found that preliminary drilling of the wire tract is an essential step. Before this was learned an attempt was made to force the pointed threaded wire through these fragments of heavy cortical bone with a motor drill. It was found impossible to control the speed of the wire to make the rate of introduction correspond exactly to the number of threads per inch (8 s.c.) on the wire. In cortical bone preliminary drilling with an 0.070 inch drill point (No. 5 of the standard drill point gauge) for use of the $\frac{1}{8}$ inch threaded wire and a 0.067 inch drill point for the 0.066 inch wire insure solid fixation. The wire is simply drilled in for the required distance and cut off when desired. With preliminary drilling of this type, the hand drill is preferable and is always used both for the drilling and for the insertion of the wire. Pointing of the wire is not necessary. When used without preliminary drilling pointing of the wire is essential.

In the treatment of fractures of the malleoli, the author uses the threaded wire for fixation incorporating the blunt end of the wire and the plaster. Several weeks postoperatively the wire is readily removed. It has been utilized for spiral or oblique fractures of the long bones. For fractures of the tibia and fibula, threaded wires afford excellent fixation. These wires have also been used for similar fractures of the femur, but have proved entirely unsatisfactory. They will not withstand the force and strain to which they are subjected in a fracture of the shaft of the femur. For this fracture, simple skeletal traction is far superior and is preferable, as has been pointed out by many authors previously.

C. FRED GORDON, M.D.

Quigley T. B. and Urist, M. R.: Interphalangeal Joints. A Method of Digital Skeletal Traction Which Permits Active Motion. *Am. J. Surg.* 947 73 175.

Recent experience has re-emphasized the necessity for maintenance of active motion throughout the treatment of fractures of the metacarpals and phalanges. While anatomic reposition is desirable, traction is more dependent upon a minimum of splinting both as to extent and time than upon elimination of bony deformity. The relatively greater area of

joint surface and mechanisms in the small joints of the hand predisposes them to rapid development of stiffness.

Manipulative reduction maintained by various types of traction is often the treatment of choice although the usual means of traction prevent active motion. Common sites for traction in the finger are (1) the fingernail, (2) pulp of the distal phalanx, (3) the distal phalanx, (4) the middle phalanx, and (5) the proximal phalanx. All of the sites present disadvantages either with regard to the production of pain or possible damage to important structures.

On the dorsal surface of the middle phalanx there is a triangular space where only skin and fascia overlie the bone and this is a logical place for the insertion of skeletal traction. Through a stab wound the cortex is drilled at an angle of 45 degrees distally with a No. 6 dental burr. A hook fashioned from a Kirschner wire is engaged through this hole in the cortex and steadied by a small dressing. It is attached by rubber band traction to a banjo splint anchored in plaster. Active motion is insisted upon which, although not over a great range is sufficient to avoid freezing of the joints.

From experience with 70 fingers so treated it was found best to place the fingers in traction in flexion, as recommended by Bunnell. Mobilization is no more rapid than from the extended position, but the functional position permits use of the hand while mobility is being re-established. Traction is rarely maintained for more than 3 weeks. This method is best suited for fractures of the proximal interphalangeal joints, proximal phalanges, and unsupported metacarpals. Three cases are reported demonstrating use of the technique in compound comminuted fractures of the second, third, fourth and fifth metacarpals compound fractures of the third and fourth proximal phalanges and simple fracture of two-thirds of the distal articular surface of a proximal phalanx.

FRANCES E. BLENKES, M.D.

Oliver, V. B.: Epiphyseal Slipping of the Head of the Femur (Desprendimiento epifisario de la cabeza femoral). *Rev. esp. ort. cir.*, 1946, 3, 138.

The causes of epiphyseal slipping may be divided into three types: the purely traumatic, the static, and the type in which there is decreased resistance of the cartilage due to general or local causes.

The lesion is more frequent in the male but more pronounced in the female. The location is practically constant. Bilateral affection however is rare. The disease goes through three stages: a latent or prodromal period characterized by pain; a progressive period which leads to a solidification of the epiphysis to the neck of the femur and the formation of a coxa vara.

The most frequent complication is an aseptic necrosis of the femoral head.

Diagnosis presents some difficulties. Differential must be made from subcapital fracture and Perthes disease. Prognosis depends upon the severity of the disease process and early treatment.

Treatment depends upon the phase of the disease. In the prodromal stage traction abduction and internal rotation may be sufficient. Later intra-articular or extra-articular osteotomy must be resorted to before any practical results can be obtained.

STEPHEN A. ZIDMAN, M.D.

Boyd H. B. and George I. L.: Complications of Fractures of the Neck of the Femur. *J. Bone Surg.*, 1947, 29, 13.

The authors report a statistical study of 300 cases of fracture through the central portion of the neck of the femur operated upon by the staff of the Campbell Clinic. Smith Petersen nails were used in 285 of the hips and Knowles pins in 15. All impacted fractures and fractures of the base of the neck were excluded.

The postoperative follow up of 151 cases was less than 1 year on account of various factors such as distance from the Clinic, age, debility, lack of funds, and transportation difficulties. Twenty-eight of the patients died (Table I).

The report on bony union or nonunion is therefore based on 141 cases: in 122 (86.5%) union occurred and in 19 (13.5%) it did not occur (Table II).

Aseptic necrosis and degenerative changes of arthritis following bony union occurred in 33.6 per cent of the cases, but all cases of aseptic necrosis did not have arthritic changes, whereas a few cases without aseptic necrosis did have arthritic changes. Aseptic necrosis can be detected in the roentgenograms with in 1 or 2 years following fracture (Tables III and IV).

TABLE I — MORTALITY

Age	Number of hips	Deaths	
		Number	Per cent.
Under 40	13		
40-50	50		
50-60	92	5	5.4
70-79	37	9	24.3
80-90	55	14	25.0
Totals	300	8	2.7

Of the total number of deaths, 1 occurred in less than 4 weeks after operation, and 7 within 4 weeks to 6 months after operation.

TABLE II — BONY UNION

Age	Union		Non-Union	
	No. of hips	Per cent.	No. of hips	Per cent.
Under 40		100		
40-50	3	91.0	3	9
50-60	4	78		0
70-79	13	0		8
80 and older	1	33		
Totals		85.3	9	2.7

TABLE III.—CHANGES FOLLOWING UNION

Follow-up period	N of hips	Aseptic nonunion		Arthritic changes			
				Moderate		Severe	
		Number	Per cent	Number	Per cent	Number	Per cent
—2 years	31	10	32.3	3	9.7	6	19.4
Over 2 years	28		34		55.2		5
Totals	59	4	31.6	3	9	8	24.6

TABLE IV.—END RESULTS

	Per cent
Mortality	0.3
Poor End Result	
Non-union	3.5
Severe arthritic changes	4.0
Fair End Result	
Moderate arthritic changes	9.0
Good End Result	43.6
Total	100

The data presented in this article indicate that the total number of patients with severe arthritic changes in the hip will exceed the number with non union. In the future, the problem of rehabilitation and treatment of the patients with severe degenerative arthritic changes may become more important than the treatment of those with ununited fractures.

DANIEL H. LEVY, M.D.

Sherman, M. S., and Phemister D. B.: The Pathology of Ununited Fractures of the Neck of the Femur. *J Bone Surg* 947 20 9

Nine case histories are presented, some in abstract and others in detail. The essential factor in these cases was the ununited fracture of the neck of the femur. The original articles contain 42 figures showing roentgenograms and photomicrographs of the involved structures and discusses the findings, facts and theories of other investigators.

The incidence of nonunion is quite high in intra capsular fractures of the neck of the femur except in the cases which have been impacted or treated by accurate open or closed reduction and internal fixation. The factors responsible for this relatively high incidence are: death of the head fragment due to disruption of the blood vessels of the neck, displacement of the fragment ends, poor immobilization and failure of peripheral callus formation.

If the head fragment survives it undergoes atrophy to the same degree as the distal fragment. Treatment in this type of case is usually successful and extensive degenerative changes in the joint do not occur. If the blood supply to the proximal fragment is severed and the head dies, the head will appear to be more dense than the surrounding trophic living bone in the roentgenogram. There is slow invasion of the head by vascular fibrous tissue. The necrotic bone is absorbed and is replaced by cancellous new bone.

The necrotic articular cartilage remains unaltered until a new blood supply reaches it, at which time it is replaced either by an imperfect type of fibrocartilage or in part by bone. Transformation of a dead head takes place first at the margins of the fracture and the foramen. A pathological fracture between the dead and living portions may result in collapse and delayed union or nonunion. If union has occurred in the presence of a dead head and if weight bearing is begun before replacement is complete, the head will probably collapse and degenerative changes will be present on both sides of the joint. If the head is adequately protected, it may not collapse. The degenerative changes are minimal and a good functional result is obtained.

RICHARD J. BERNARD, Jr., M.D.

ORTHOPEDICS IN GENERAL

Lamas, A., Arnado, D., Celestino Da Costa, J.: The Blood Supply of Bone (La circulación de sangre en los huesos). *Press med.*, 946, No. 63 862.

This article is based on experiments on animals carried out in the laboratory organized by Reynaldo dos Santos. Studies on the blood supply of bone have been neglected somewhat although it is of great importance in the study of the physiology of bone. In spite of a number of attempts it was impossible to visualize a "bone artery" by means of arteriography. Hundreds of arteriograms were taken and several different methods were used, with the result that every artery in the soft parts was visualized but not a single "bone artery." Larger doses of contrast medium were used and serial roentgenograms were taken but without success.

Arterial therapy also shows different effects in infections of the soft parts as compared with infections of bone. The therapeutic effect of penicillin given in the arterial route was very good in cases of soft tissue infection but showed no results in infections of bone. The arterial route was used in 2 patients with a severe infection of the forearm and of the thoracic region and patients with osteomyelitis. After 3 or 4 intra arterial injections of from 15,000 to 20,000 Oxford units of penicillin the infection in the soft parts healed completely without surgical intervention. In the cases of osteomyelitis, however, there was no change in the disease in spite of the fact that much larger doses were used.

The analogy of the results of arteriography and arteriotherapy appeared significant. It was not the insufficiency of the blood supply in bone which explained these facts. Arteriograms of bones in the cadaver were unsuccessful unless the efferent vein was ligated (Lexter). It was found that there was a large arterial network in bone as well as "blood lakes" and these findings were confirmed by histological studies made by the authors. Another conclusion known but little emphasized is that blood does not spurt but only dribbles from a cut surface of bone; this has been frequently observed in amputations and trephine openings.

A search of the literature for an explanation of these observations was unsuccessful. Leriche in his

Treatise on the Physiology and Pathology of Bone stated that the circulation slows down when entering the bone. This slowing down should be brought in accord with physiological requirements. In addition to being a depot for calcium, bone has two functions one of support and the other of hematopoiesis. None of these functions requires an active circulation. The calcium metabolism is slow and it is regulated by glands of internal secretion. When the "bone is doing work," i.e. when the extremity is in motion, it is not subject to any change and there is no need for an increase in its blood supply such as observed in the adjacent muscles. Its function of support is of a static nature. It operates like a lever. There is no evidence of contraction like in a muscle. There is no evidence of sudden changes within the bone which would require an active circulation.

As far as hemopoiesis is concerned, a rather slow flow of blood is necessary this can be interrupted for short periods to allow young blood elements to enter the bloodstream at a rate dictated by the needs of the organism. In the spleen which has a similar function the circulation often comes to a standstill. The experiments of Kinsley and Husch show clearly that sphincters are placed at the entry and exit of every spleen sinus to stop the bloodflow in order to give the circulatory elements a chance to pass the vessel walls. All this indicates that the circulation actually slows down in bone, but it does not explain the ineffectiveness of arterial therapy and the inability to demonstrate the arteries in an arteriograph.

Carmine injected into the external iliac artery of a dog appeared in a soft tissue wound after 4 seconds in the skin after 7 seconds and on the cut surface of the bone marrow after 1 minute (it never appeared in the compact portion of the bone). The color of the dye was very pale in the bone marrow as compared with that in the skin. These experiments indicate that the circulation in bone is slower and that substances entering bone via the arteries get there in small quantities and become greatly diluted.

Histological studies show that the arteries in bone are constructed differently than arteries in the soft tissues. The nutrient artery of bone has a thick wall, thick intima, and a small lumen as compared with its size. Before entering the bone it describes a number of curves and then divides into two branches. Its ascending and descending branch supplies the bone marrow and probably some haversian canals. Finally it opens into the 'blood lakes' near the epiphysis. Large veins with very thin walls leave these blood lakes. These veins unite to form the vein which accompanies the nutrient artery. Its lumen is large as compared with the lumen of the nutrient artery. There are hardly any blood vessels in the periosteum of the diaphysis. The arteries lying in the haversian canal have a single endothelial layer of cells surrounded by a sparse layer of mesenchymal tissue.

The curves in the nutrient artery are responsible for the slowing down of the blood flow. A further slowing down of the blood stream is accomplished by the division into many branches. It loses its pulsating character and by the time it reaches the capillaries the blood flows slowly and evenly. The same happens if the blood is forced to run through collaterals but the pulsating character is lost much sooner.

There is another reason why there is no pulsation of the arteries in the bone. The arteries are enclosed in a rigid frame of compact bone. Physiological, pathological, or therapeutic vasodilatation cannot occur as it does in other tissues. Sympathectomy causes some changes in the arteries in the bone. The arteries of the bone have also an adventitia but it is quite dissimilar to the adventitia of the soft tissues. It is quite possible to prevent contraction of the artery in the bone but dilatation is very unlikely to occur. The narrow lumen of the nutrient artery admits only a small quantity of blood at a given time and the winding of the artery its division into numerous branches, and its course in a rigid frame make the blood circulate under low tension and without pulsation. In addition, it stagnates in the blood lakes and large veins. These facts explain why the arteries cannot be visualized on the arteriographs and why drugs placed in the blood stream have no appreciable therapeutic effect in case of infections of bone.

These observations do not clarify the physiological problems of bone but show them in a different light. It is quite likely that changes in bone attributed to ischemia are really due to blood stasis.

Some pathological conditions of bone need a great deal of blood which cannot be supplied by the bone arteries. The arteries are unable to dilate and to furnish the nourishment required by the lesion. In these cases the arteries of the surrounding soft parts multiply and hypertrophy. This happens very frequently in tumors. It is quite possible that bone tumors originate in the soft parts since bone is unable to furnish the necessary blood supply. Furthermore the arteries of the soft tissues are unable to perforate healthy compact bone to get to the tumor.

It is possible that the tumor originates in the periosteum or subperiosteal tissues and eventually invades the bone.

GEORGE L. REES, M.D.

Wolbach, S. B.: Vitamin A Deficiency and Excess in Relation to Skeletal Growth. *J Bone Surg* 1947 29 171

Deficiencies of vitamins A, C and D affect bone growth directly. Deficiency of vitamins A and D involve epiphyseal cartilage cell activities. Vitamin C deficiency in growing animals affects all collagenous structures. Vitamin A is unique in that when given in great excess it actually accelerates normal growth sequences. The acceleration bears quantitative relationships to the amount of vitamin A administered.

The deposition of bone by cells of the endosteum and periosteum is called appositional bone formation. The growth of membranous bones is entirely by appositional bone formation.

Endochondral bone formation sets the pace and the pattern of skeletal growth.

Vitamin C deficiency prevents bone formation by causing a failure of matrix formation specifically a failure in the synthesis of collagen. Administration of Vitamin C to guinea pigs totally deficient in this vitamin is followed by the prompt deposition of collagen and the formation of the matrices of connective tissue bone and teeth.

Vitamin D deficiency results in a failure of the bone matrix (osteoid) to calcify. Efficient concentrations of calcium and phosphorus ions in the blood plasma are not maintained.

The cytomorphosis of the cartilage cells is disturbed, in that they fail to complete the normal sequence which ends in degeneration and death. The epiphyseal cartilage accumulates. There is no ingrowth of capillaries to fill the spaces which normally result from the disappearance of cartilage cells. Administration of Vitamin D is rapidly followed by a resumption of cytomorphosis, extensive penetration of capillaries, and concurrent calcification of the adjacent matrix. Thus, in rickets two separate processes are involved. One is the failure of epiphyseal cartilage cells to complete the sequences of proliferation, maturation and degeneration and the other is the failure of matrices to calcify.

Hypervitaminosis-D as produced by the administration of excessive amounts of activated ergosterol leads to a great rise in serum calcium. If the alimentary source of calcium is not adequate calcium is obtained through the resorption of bone. The stoichiometry of blood calcium seems to have quantitative relations to the amount of vitamin D introduced. The maintenance of high calcium levels in rats through its use results in short bones with noncalcified trabeculae of unusual thickness and number at the diaphyseal ends, and resorption of cortical bone with noncalcified matrix deposition of periosteal and endosteal origin. By some authors this is regarded as a rachitic type of change.

Vitamin-A deficiency results in a cessation of all cellular sequences in the epiphyseal cartilage. Osteoclasts absorb the cartilage trabeculae which were calcified before the deficiency was established.

Dense calcification of the matrix of the diaphyseal border of the epiphyseal cartilage results in a thin plate of bone across the face of the epiphyseal disc. The cessation of bone growth is not accompanied by cessation of growth in other tissues, and in young experimental animals the central nervous system which grows, becomes paralyzed as the result of mechanical pressure within the skull which does not grow.

Remodeling of young bones ceases and appositional bone formation continues, which results in short thick bones. The appositional bone growth is in strict conformity to normal growth patterns until

inanition supervenes. The pressure on the nervous system is not due to excessive appositional bone growth.

Hypervitaminosis-A results in a great acceleration of all processes of growth which can be followed microscopically and specifically with regard to the epiphyseal cartilage sequences and in the resorption of bone and appositional bone formation necessary in the remodeling of bone in skeletal growth. Fractures are produced in from 6 to 10 days by the accelerated remodeling process. When large amounts of vitamin A are given, the linear growth rate of bone is retarded and there is a decrease in food consumption and growth of the animal (rat) as a whole. The larger the amounts of vitamin A administered, the greater is the retardation of growth and the greater is the rate and frequency of fractures.

There is no increase in the rate of multiplication of the cartilage cells, but there is an increased rate of growth maturation and death. The author concludes that some agent is released by this process which is responsible for the remodeling process of bone growth. He discards the explanation that it is a response to mechanical stimulation.

The description of the microscopic changes which are presented in considerable detail does not lend itself to condensation.

Fractures of long bones are easily accounted for by the extensive loss of previously formed cortical bone before the newly deposited bone has acquired strength. They occur at sites where remodeling is normal growth is most active. The new bone is set firm because its matrix has failed to mature or completely calcify.

A study of the ductless glands of animals with an excess of vitamin A revealed no demonstrable changes in the pituitary, thyroid, or parathyroid glands. Changes were seen in the adrenal glands, but their significance is not known for certain.

The dosages of Vitamin A in these experiments were tremendous, and were not compatible with life.

NEWTON C. MEAN, M.D.

Wietkower E.: Rehabilitation of the Limbless: A Surgical and Psychologic Study. *Corp. M.* 9:17 3 30.

This article well describes a useful approach to the limbless patient on the part of all those individuals who must deal with him.

The patient who has lost a limb naturally mourns his loss and must frankly show it or hide his grief behind a wall of psychological defense. Hence, he requires skillful handling of his depression based on understanding of its fundamental nature and not pity, praise, or a cheer up of man approach.

In a study of 200 amputees the following types of reaction were noted: 25 per cent showed persistent depression, over and above the transient depression experienced by the majority; 21 1/4 per cent became impatient, irritable, ill tempered and resentful no matter what was done for them, these patients remained dissatisfied and discontented full of resent-

ment toward the doctors the hospitals the government's provision for their care and even toward themselves, 5 1/2 per cent developed excessive anxiety about the future doubting their working capacity and the chance of making a living 21 3/4 per cent of the patients reacted to their disability with defiance, these individuals were uncommonly ambitious and were determined to make the best of a bad job. Some 14 of the 43 members of the last group showed cracks in the carefully built up facade by complaining of sleeplessness nightmares irritability trembling and crying fits.

Cheerfulness was the reaction characterizing 24 per cent of the patients and was very common in the early phases of the severely disabled. Genuine satisfaction over the loss of a limb in men who were thus exploited of a deep sense of guilt was rare. A few men were happy to pay such a price to get out of service. A small number showed no depression nor any protective measures against it.

The type of reaction depended upon a multiplicity of factors including the previous personality, the degree and site of the injury the functional efficiency of the artificial limb and the social and occupational situations. About 50 per cent of the patients studied were in a state of emotional maladjustment.

Vernon C. Turner, M D
 Industrial Injuries of the Back.
 Occup JI 1947 3 53.

Dickson divided the cases of backache seen in an industrial practice into four main classes according to their etiology.

1 The first group consisted of strain or rupture of the muscles or ligamentous structures of the lumbosacral area caused by overuse (fatigue), excessive lifting or direct trauma and the condition was characterized by lumbar muscle spasm localized tenderness over the affected region and limitation of back motion. The author believes that if the strain is severe enough the patient should be hospitalized immediately for bed rest traction manipulation under anesthesia injection of the trigger point with eucupin and procaine and graduated exercises.

2 The second group presented arthritis of the lumbosacral joint. In this condition there are proliferative changes about the small joints and in elasticity of the ligaments. It is characterized clinically by (a) persistent dull aching low in the back, made worse by back motions (b) limitation of motion of the lumbar spine (c) referred pain usually into the hips and lower abdomen and (d) roentgenologic evidence of joint change in the spine. Ankylosing arthritis of the spine must be differentiated from hypertrophic or traumatic arthritis. It is characterized by increase of pain on rest rather than activity by a "poker back" by occurring in a younger age group and by roentgen evidence of involvement of the sacroiliac joints as well as of the spine (in a later stage).

Treatment consists of bed rest traction physical therapy exercise and possibly a back support.

3 This group consisted of sprains and subluxations of the sacroiliac joint. Dickson finds this to be a very rare condition which is characterized by pain and tenderness directly over one or the other sacroiliac joint a roentgenogram will show actual separation of the joint.

Treatment consists of bed rest with strapping and later a specially designed belt.

Sprains and subluxations of the lumbosacral joints are also included in the third group. These are the most frequent causes of back pain (other than arthritis) because of the frequency with which congenital abnormalities which weaken the joint decrease its stability and render it vulnerable to injury are found.

4 The author believes that cases of protruded intervertebral disc complicating a previous weakness low in the back should have the benefit of exploration for the ruptured disc, its removal and spinal fusion. The case of uncomplicated intervertebral disc should be subjected to excision of the ruptured disc, but no fusion.

Vernon C. Turner, M D

SURGERY OF THE BLOOD AND LYMPH SYSTEMS

BLOOD VESSELS

Christophe, L., and Honoré, D.: Arteriography by Injection and Automatic Taking of Negatives (L'artériographie par injection et prise de clichés automatiques) / *chir* Par 947 63 5.

Increasing need for arteriography not only in brain surgery but also in surgery of the extremities induced the authors to invent an arteriographic apparatus. The apparatus, which appears complicated at first sight, can be operated by simple pressure of a finger on an electric button with the resultant intra-arterial injection of a negative taken at the moment of production of a contrast medium, has been discarded because (1) certain autopsies revealed microscopic hemorrhages in the brain due to this medium (2) demerol substances are capable of causing delayed sarcomatous new growths, this having been observed after a single injection of 30 c.c. of thorotrast and (3) thorotrast is manufactured by factories now in the Russian zone and therefore they were unobtainable until after the end of the war. In place of thorotrast the authors use umbradil, which consistently gives good results and is entirely innocuous.

The apparatus permits the injection of very variable amounts of contrast fluid at rates equally as variable. Three cubic centimeters can be injected in 10 seconds or 30 c.c. can be injected in 1 second. This adaptability of the apparatus permits the authors to use it not only for arteriography of the brain but also for arteriography of the aorta and of the arteries of the extremities. After aortography when the authors are assured of the permeability of the iliac and crural arteries, a second injection into the femoral artery is made and a complete arteriogram of the lower extremity is obtained. Three exposures,

one each of the thigh, leg and foot, are made after one injection of the femoral artery.

The authors have come to use arteriography almost routinely on their surgical service. They use it especially in the study of the sequelae of serious brain trauma, in which cases epidural and subdural hematomas can be localized. It is used, also, in the treatment of diseases causing obliteration of the arteries. Systematic preoperative roentgenologic study of the peripheral arteries in cases of arteria permits the selection of an operative procedure and aids in the prognosis in this uncertain and inoperable affection.

Description of the apparatus. The apparatus is composed of a mechanism for injection and a system of automatic contacts.

In the injection mechanism (Fig. 1) an electric motor (A) pushes a metallic bar (B) at a variable speed by means of a circular ratchet, a metallic bar (B) and the extremities of the bar press upon the piston of a syringe (C). The progression of the bar assures the injection. The volume and the weight produced by the electric motor (A) are required for easy manipulation of the apparatus. The authors have been completely satisfied with a small motor of 22 volts, continuous, supported by a rectifier mechanism in the system.

The speed of the motor regulated by a brake (E) permits more or less rapid injection, according to the artery to be examined and the affection suspected. In order to allow easy manipulation of the bar of propulsion (for example at the moment of refilling the syringe) the cogged wheel, which sets the ratchet in motion can be disengaged by means of a lever (F). At the moment when the apparatus is in use, the lever is brought down the cogged wheel engages, and the apparatus is ready to function. The apparatus has, in addition, been improved by the use of the action of a magnet (G). A core of soft iron (H) attached to the end of the propulsion bar enters into

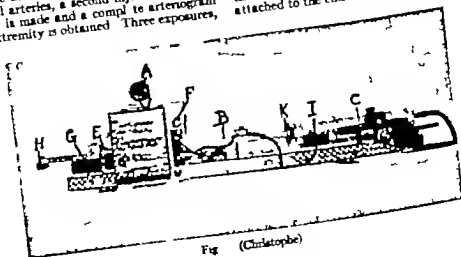


Fig. (Christophe)

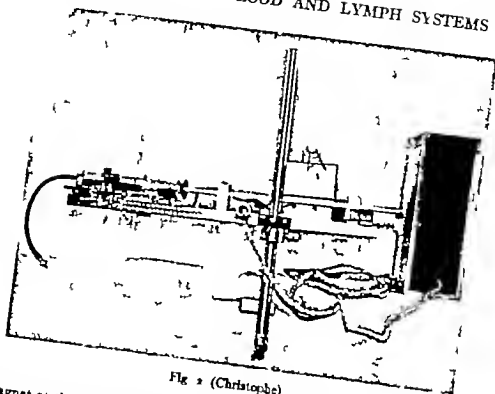


Fig 2 (Christophe)

the field of this magnet at the time of the injection. It brings about the disengagement of the ratchet, avoids wear and tear and prevents reflux in the syringe.

The entire apparatus is mounted (Fig 2) on a hinged bracket fixable to the roentgenographic table. It can be brought very near to the body of the patient.

The automatic release of the roentgen tube is composed of a slide contact placed parallel to the propulsion bar. The slide contact supports two platinum terminals which are separated from one another by a spring.

At the time of functioning the stop (L) comes in contact with the slide contact releases the spring closes the circuit in the two terminals throws the roentgenographic apparatus.

It is necessary that the slide contact be mobile in order that the negative can be taken at the exact moment of injection.

Operation of the apparatus

- 1 The electric circuit is checked
- 2 The speed of the motor is regulated according to the caliber of the needle and the speed of injection desired.
- 3 The opportune moment for taking the negative is calculated. The slide contact is placed opposite the number of cubic centimeters which are to be injected.
- 4 The full syringe is put in place
- 5 The propulsion bar is placed in contact with the cogged wheel.

The apparatus is ready for use

BLACKWELL MARRIAM, M.D.

Stewart, C. F.: War Experiences with the Nonsuture Technique of Anastomosis in Primary Arterial Injuries. *Ann. Surg.* 1947 125 137

This article is concerned with the problem of restoring blood flow through arteries damaged by missiles. Seven cases of gunshot or shell fragment wounds of major arteries are presented. These were representative vascular injuries, demonstrating division of the artery in 3 cases, thrombosis in 2 and lateral laceration in 2. The author describes the use of a vitallium tube lined with a vein segment which overlapped the ends of the tube. This is the method that was used in the cases that are presented. In all of these vessels a nonsuture anastomosis was attempted with varying results. The limbs of 3 of the patients survived. This makes a survival of 43 per cent in this group.

The author notes that it is futile to compare statistics in so small a series and adds a record of the results of the major vascular surgery in the first half of 1945. Inclusion of the prosthesis cases in the statistics during this period raises the survival of limbs in cases of superficial femoral artery from 57 to 63 per cent. In the statistics for the brachial artery this survival falls from 88 to 78 per cent with failure in 1 prosthesis case. The statistics show that survival in the popliteal group rises from 0 to 11 per cent.

A discussion of technical difficulties and of possible improvements is given.

The author concludes the article by outlining the ideal treatment of a case with a lacerated divided or thrombosed artery as follows

Preoperative treatment

- 1 Shock treatment morphine to allay pain transfusions with proper type of blood to restore the blood volume

2 Propylactic treatment antitetanic toxoid or serum with polyvalent gas gangrene serum if the conditions indicate it.

3. A sympathetic nerve block should be done on the affected side.

Operation

1 Wide and thorough débridement of the wound

2 Clean isolation of the vessels involved and temporary local occlusion of the artery with rubber guarded clamps.

3 A cursory examination of the collateral circulation, which will give an idea of its ability to support the limb.

4. Preparation of the prosthesis: adequate size from the adjacent vein: it must be reversed and one end kept marked

5 Débridement of the ends of the artery and periarial stripping 1 inch away from the divided ends.

6 Removal of all clots from the vessel ends and irrigation of them with a heparin-saline solution.

7 Insertion of the largest sized prosthesis that can be used, the procedure being started with the upper end of the artery and the upper clamp released to be sure that the flow passes through the prosthesis.

8. Firm double ligation of the arterial ends over the prosthesis with heavy silk.

9. Release of the occluding clamps.

10. Closure of the vascular sheath and wound when ever possible.

11 Local block of the nerves of the involved limb

Postoperative care

1 The blood volume should be kept up with whole blood transfusions as indicated.

2 Penicillin or chemotherapy should be continued.

3 The patient should be heparinized by subcutaneous injections of the drug in Pitkin's menstruum.

4. Reported nerve blocks should be given as long as the state of the circulation is in doubt.

5 The extremity should be splinted in a neutral position for from 10 to 14 days.

6 The limb should be maintained at a subnormal temperature.

HAROLD F. THURSTON M.D.

BLOOD TRANSFUSION

TOURNIAIN, L. M.: The Mechanism of Hemostasis.

Ann. Surg. 1947 35 29

This is an expository review of the existing knowledge of blood and vascular physiology, particularly integrating some of the facts that have been brought out during the past 5 years. Petit was among the first to call attention to the significance, in the spontaneous arrest of bleeding from wounds, of the plugging mass formed within and just outside of the opening of divided vessels.

In recent years, research and discussion on the mechanism of hemostasis and its disorders have been chiefly concerned with the coagulation of blood and the properties of the clot. The spontaneous arrest of bleeding involves more factors than those contributed by the blood alone. After a given injury the amount of bleeding will vary according to the pro-

viding efficacy of the hemostatic mechanism in the involved area. Moreover factors which contribute to the continuation of bleeding in one section of the body may have a negligible influence in another.

At least three groups of factors may be said to be engaged in preventing or checking blood loss from the body: (1) extravascular factors, (2) vascular factors, and (3) intravascular factors.

EXTRAVASCULAR FACTORS

Location of the vessel. If the vessel runs close to the surface with little or no tissue intervening between the vessel and the air it is at some disadvantage insofar as hemostasis is concerned. This is particularly true in nasal bleeding. The small vessels coursing along the mucous or serous surface of the gastrointestinal respiratory or urogenital tract, or of any other hollow viscera are likewise deprived of such support: therefore much blood may be lost.

Tissue tension or elasticity. Tension in the tissue surrounding the vessel wall protects it from damage and aids in resisting the flow of blood through the damaged site. The elasticity of the skin is thus an important factor in small cuts. In the aged elasticity is lacking. Vessels coursing through bone, ligaments, cartilage, or other semirigid structures are well protected from injury because of the rigid support about them. The noncollapsible character of the tissue about such vessels may however delay hemostasis when the rigid channel through which the vessels run is destroyed.

The resistance offered by the tissues of the body to forcible distention varies, of course with the type of tissue. This resistance is known to oppose the loss of fluid from vessels, and it also influences the escape of blood from them. The tissues of certain organs, like the brain, offer little resistance to blood extravasations. Whenever loose areolar tissue surrounds a vessel, it affords little resistance to extravasated blood. Scleroderma is just the opposite.

The content of thromboplastic substances in the tissues may conceivably have some influence on the rapidity of the clotting of blood escaped from the vessels. Anticoagulant materials are also found in the tissues in varying concentration and potency apparently aided by side with thromboplastic substances. Tissue autolysis will often destroy the clot accelerating substances.

VASCULAR FACTORS

Structure of the vessel. This is principally related to the essential difference between arteries and veins as to elasticity and muscular tissue as well as to their relative sizes and the pressure within. The state of relaxation or spasm as a related factor is severance is of the greatest importance.

INTRAVASCULAR FACTORS

The hemostatic plug. This plug may consist of platelets alone, fibrin, white cells, red cells, or all in combination. Arrest of bleeding depends in a large measure on the formation of this plug by elements

from the blood itself. Formation of the plug may be separated into three phases each of which may occur independent of the other or fail to appear altogether. These phases are (1) platelet massing (2) deposition of fibrin and (3) contraction and hardening of the platelet/fibrin plug. Platelets from the blood are attracted to the damaged zone come together, and adhere to and form a layer over the area. This is probably the simplest form of reaction of the blood to an injury of the vessel wall. It may be the only form of reaction to injury in small vessels when the blood pressure and volume are relatively low and the vessel walls thin and collapsible. When the platelets come together they may swell burst and liberate substances with clot accelerating properties. A thin fibrin film may then be deposited at the point of contact between the platelet mass and the overlying blood. Other platelets then adhere to the film and form clumps. Platelet massing requires that there be an adequate supply of platelets with the proper degree of agglutination ability and capacity for adhesion. The number of platelets in the peripheral circulation depends somewhat on the rate of production, the rate of utilization or destruction, and their distribution in the body. The platelets originate from megakaryocytes found principally in the bone marrow. The normal rate of production is probably 100,000 platelets per cubic centimeter of blood per day. This is accelerated after hemorrhage.

Platelet utilization and destruction are intimately linked, since when the platelet is used it is nearly always destroyed. Generally the utilization of platelets increases whenever the body is exposed to excessive stresses. The reverse takes place when the illness is over. The distribution of platelets is not uniform throughout the vessels and more are found in the arterial than in the venous blood of the extremities.

In vessels in which the pressure or volume of blood is high much of the effectiveness of the hemostatic mechanism depends on the rapidity with which the fibrin clot will form and the promptness with which the clot will become dense, adhere to the vessel wall and retract itself.

Fluidity and coagulability of the blood are antagonistic to one another. It is by keeping a balance between the fluidity inducing (anticoagulant) and coagulation promoting (coagulant) factors that the blood maintains itself as a circulating medium. These factors are well known. The changes that occur in the blood after it is shed and brought into contact with foreign surfaces present three phases.

First phase: release of cephalin and reduction and eventual loss of the natural anticephalin activity of the blood when it comes in contact with the released cephalin or the damaged surface of the vessel. The normal slowly reacting prothrombin is made highly vulnerable to the action of cephalin. There is no particular order of these steps.

Second phase: transformation of prothrombin to thrombin. This depends on the amount of cephalin available and the extent of the anticephalin activity

Third phase: Action of the thrombin on the fibrinogen with the production of fibrin. The clot is eventually liquefied by the action of fibrinolysin.

As long as the contacting surface of the interior of the blood vessel (endothelium) is intact, the stability of circulating blood will be unaltered. When the surface is damaged the stability is threatened by the presence of cephalin rich tissue juices which help to neutralize the blood anticephalin activity and to accelerate the conversion of prothrombin to thrombin, and the changes in the physical properties of the surface in contact with the blood. The damaged surface helps to remove anticephalin from the blood and aids in the disintegration of platelets and leucocytes with the consequent release of more cephalin from the platelets.

The term cephalin serves to designate the lipid or group of lipids with clot accelerating properties which form the active component of thromboplastic tissue and platelet extracts. It is found especially in the brain, lung, heart, and testicle. In the blood itself it is found chiefly in the platelets and leucocytes. On disintegration, platelets release cephalin; this is thereby dispersed through the blood and initiates the changes in the immediately neighboring areas which eventually lead to the formation of thrombin. The number in the blood is about 40 times that required to accelerate the coagulation of normal blood. Platelet disintegration however is the important factor. The two most important factors that influence platelet disintegration are the coagulability of the plasma in which the platelets are suspended and the extent of contact with surfaces favoring their disintegration.

When suspensions of human cephalin or cephalin containing substances are incubated with normal human plasma in plastic or collodion coated tubes, their clot accelerating power is greatly reduced. This property is termed anticephalin activity. Little is known regarding the nature, source and mode of regulation of this activity.

Prothrombin is a protein with many of the characteristics of the globulins, and is probably the clotting factor about which the greatest amount of information is available. The amount of prothrombin ranges between 5 and 10 times the amount required to bring about prompt coagulation of the blood. Other factors being equal a diminution to about 10 per cent of the normal, or less, is necessary before a significant change is observed in the rate of clotting and the quality of the clots formed. This diminution may result from the increased utilization as after widespread trauma or long illness, the imperfect synthesis of prothrombin by the liver, improper digestion or absorption of an otherwise inadequate diet, deficient intake of vitamin K, the effect of certain drugs or from vascular or congenital idiopathic hypoprothrombinemia.

Fibrinogen is the blood protein which when acted upon by thrombin is transformed into fibrin. It is principally formed in the liver. From 180 to 400 mgm. per 100 ml. is the normal range.

Fibrinolytic is an agent which brings about dissolution of the fibrin formed during coagulation. It probably exists in the plasma in the form of pro-fibrinolytic and requires activation.

Antithrombin offsets the action of thrombin. The activity appears to reside in the albumin fraction of the plasma or a constituent closely associated with that fraction. The union of thrombin and this albumin constituent leads to the formation of meta-thrombin, an inert product insofar as clotting is concerned.

In order to be effective the hemostatic plug must be formed promptly and meet certain requirements. Desirable attributes are adhesiveness, rigidity and contractility. Generally speaking the faster the blood will clot, the more rapidly will it develop the desirable physical attributes.

THE DYNAMICS OF HEMOSTASIS

The spontaneous arrest of bleeding nearly always involves two phases which take place regardless of the type of vessel involved.

First phase (vascular) Immediately after blood begins to escape from a vessel the pressure drops, the vessel walls contract, retract, or collapse and if the blood is escaping into the tissues, the surrounding tissue tension increases. The blood is then rerouted through another vessel.

Second phase (hematogenous) The relative slowing of blood flow during the first stage affords it the chance of coming into contact with extravascular tissues or the damaged vessel wall and precipitates the changes which lead to the plugging of the lacerated area. The longer the first phase lasts, the greater the chance for these changes to take place.

The order of succession, duration and magnitude of the changes included in these two phases varies considerably according to the type, caliber and location of the vessel or vessels, involved and the volume, pressure, and other properties of the blood within. Arterial blood of the systemic circulation seems to have a higher platelet content than venous blood. This favors the highest level of hemostasis in arterial blood, but is offset by the higher pressure and rate of flow.

Another variable introduced by the changing caliber of the vessels is that the rate of clotting of a

given mass of blood varies inversely to the extent of the surface in contact with the blood. Generally speaking the greater the surface in contact with a given amount of blood, the faster the coagulation. Likewise the chances for adhesion of the clot are greater if the blood is spread over a large surface. This reaction should be most effective in small vessels.

The structure of the vessel and the pressure of the blood within it determine to a great extent the relative importance of each of the hemostatic factors. In arteries, with blood pressures of from 100 to 120 mm. Hg. and arterioles from 60 to 70 mm. Hg. the factors, in order are vascular contraction and retraction, formation of the hemostatic plug, external compression and platelet massing. In capillaries, with blood pressures from 30 to 40 mm. Hg. and venules, from 10 to 20 mm. Hg. the factors, in order of importance, are external compression, platelet massing, vascular contraction, and formation of the hemostatic plug. In veins, with pressures from 0 to 10 mm. Hg., the factors, in order are platelet massing, external compression, formation of the hemostatic plug and vascular contraction.

A few general deductions are:

1. The nature of the defect determines to a large extent what vessels will be affected and these, in turn, determine the location and type of hemorrhagic manifestations.

2. Failure of spontaneous hemostasis may not necessarily follow a deficiency or absence of any one, or even two, of the factors named, provided the existing stresses are moderate and exerted chiefly on vessels not wholly dependent on these factors to check the flow of blood.

3. Most methods of securing hemostasis are attempts to duplicate in one way or another the principal steps of the natural mechanism of hemostasis, namely (a) external compression by the use of dressings, packs, distensible bags, and other devices; (b) contraction and retraction of the vascular wall with ligatures, clamps, forceps, or certain drugs like epinephrine; and (c) formation of the hemostatic plug by supplying or aiding the body to produce prothrombin, fibrinogen, platelets, or other constituents that it may lack.

LEROT J. KLEINSMITH, M.D.

SURGICAL TECHNIQUE

OPERATIVE SURGERY AND TECHNIQUE POSTOPERATIVE TREATMENT

Owens N: Implantation of Fascial Strips through the Masseter Muscle for Surgical Correction of Facial Paralysis. *Plast Reconstr Surg* 2: 1937: 25

Facial paralysis presents a psychological as well as a physical condition. The imbalance of the facial muscles results in great distortion on any attempt at expression.

Psychologically inferiority complexes and morose dispositions frequently develop. Injuries to the facial nerve, either accidentally or due to radical surgical procedures are increasing. Many operative procedures have been attempted to offer relief in these cases. Two fundamental procedures remain—muscle transplants and support by fascial strips.

The literature is reviewed in detail. The purpose of surgical intervention is twofold: to give support

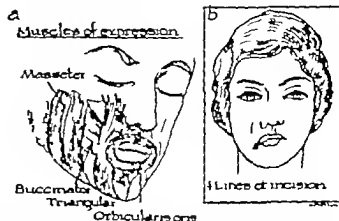


Fig. 1 (Owens) a, Drawing showing some of the important muscles of expression. b, Drawing showing the sites of the 4 skin incisions utilized in this operation.

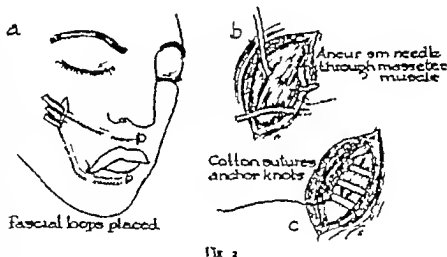


Fig. 2

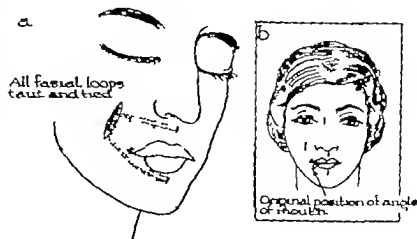


Fig. 3

to the involved side of the face, and to offer reanimation. To secure these objectives muscle pull must be associated with the supportive features. The use of the masseter muscle is indicated since it is powerful and close to the paralyzed muscles (Fig. 1).

Fascia lata strips about 25 cm. long and 1 cm. wide are formed into loops. Three loops are used. An incision is made exposing the masseter muscle and this is connected by tunneling with a small incision in the upper lip past the midline on the unaffected side, a small incision in the lower lip past the midline on the unaffected side, and an incision at the corner of the mouth on the affected side. The free ends of each loop are passed from the smaller incisions subcutaneously to the incision over the masseter. Then one free end of each loop is passed through the body of the masseter muscle. The ends of the loop are drawn taut to elevate the lip and angle of the mouth about 1 1/4 cm. The fascial loop is knotted and securely fixed into position by interrupted No. 30 white cotton sutures. The skin wounds are closed. Support to the lip for from 16 to 21 days is given by gauze strips fixed with collodion (Figs. 2 and 3).

A report of 21 operations for facial paralysis is given. The author states "The operation which offers support and reanimation in cases of facial paralysis by means of fascial strips which connect paralyzed muscles with a functioning masseter muscle is the operation of choice."

EARL H. KLASUNDE, M D

Cummine H: Postoperative Thrombosis and the Blood Coagulation Times. *Med J Australia* 1947 1 302.

The author points out that spontaneous intravascular thrombosis may occur not only after operation when it stands out as a separate entity but also in diverse medical conditions in which it is frequently masked completely by the primary disorder.

The history of anticoagulant therapy is reviewed beginning with Murray's report on the use of heparin in 1940. Heparin which appears to be an antiproteinase and an antithrombin has an immediate action in prolonging the coagulation time. In the author's hands, the only reliable method of administration was by the intravenous route with the object of maintaining the coagulation time between 10 and 15 minutes.

Dicoumarol inhibits prothrombin formation by the liver. Its effect may not be apparent for 24 hours, and the dose is regulated by a daily determination of the prothrombin index, the object aimed at being 50%. Its greatest advantage is that it can be administered orally. Ideal therapy consists in the combination of both anticoagulant drugs.

Early signs and symptoms of thrombosis are rise in the pulse rate and temperature, muscle cramps in the calf and retrosternal oppression or chest pain. Early postoperative ambulation, bed exercises, and deep breathing are valuable prophylactic measures.

The writer has confirmed the observations of Bergquist of Copenhagen who established the use of

the postoperative coagulation graph. Bergquist found that in the cases in which intravascular thrombosis subsequently developed, the coagulation time came down and remained at 3 minutes for a period of hours before the onset of clinical signs or symptoms, and that the intravenous use of heparin at this stage prevented the onset of the condition. The capillary tube method for estimating the coagulation time is recommended.

The blood coagulation time varies from hour to hour and day to day so that the graph resembles an undulating curve. An isolated reading of 3 minutes or less frequently occurs and is of no significance, but fixing of the reading at this low level is suggestive of developing thrombophlebitis or pulmonary embolism.

The author treated 16 patients with pulmonary embolism, none of whom died. In these cases, heparin was either administered intermittently at 4 hour intervals or introduced through the rubber tubing of a continuous intravenous drip apparatus when required. The coagulation time was kept between 10 and 30 minutes and as near to 15 as possible. It was rarely necessary to administer heparin longer than a few days. There were no instances of hemorrhage or idiosyncrasy due to heparin.

Active motion, bed movements, and deep breathing exercises were instituted as adjuncts to heparin. Ambulation as early as possible was practiced. Massage was forbidden. Penicillin was given continuously to prevent superadded infection.

Dicoumarol was used in conjunction with heparin in some cases. In 1 case, melena, hematemesis, and wound hemorrhage developed with a prothrombin index of 30 per cent. An index of 50 per cent is probably more satisfactory. The coagulation graph is not affected by the administration of dicoumarol.

Serial electrocardiographic tracings were made in most cases, as it was found that a single tracing is of diagnostic value in only a small percentage of cases. The electrocardiogram may lend valuable confirmatory evidence or may be of no diagnostic value.

Chest x-rays may reveal an area of pulmonary infarction immediately. Other roentgenologic pictures may reveal frank consolidation, pleurisy with effusion, dilatation of the pulmonary cones, enlarged right heart, and increased hilar shadows. Very often the x-ray offers little help.

No significant changes in the leukocyte count or blood platelet count were noted.

S. LYON TRITTMAN, M D.

ANTISEPTIC SURGERY; TREATMENT OF WOUNDS AND INFECTIONS

Chidichimo, G.: The Spontaneous Evolution of Felons—Treatment with a Closed Method without Intervention (Evolutione spontanea del piodroma—Trattamento di un metodo chiuso) con o senza intervento. *Pediatrics*, Chir., 1947 54 19.

In a study of 70 cases of felons and phlegmons of the hand, treated by immobilization for from 1

days in a plaster cast by surgical incision and then the application of a cast or by primary immobilization and then incision, followed by a new application of plaster the author has noted the beneficial effect of immobilization in all of the cases. A cure of the superficial felons was obtained after 8 or 10 days. In the deep infections the infective process became circumscribed with diminution of pain, and sometimes a spontaneous opening with elimination of a necrotic core or bone sequestra occurred and the fever was dissipated.

Using a similar method of treatment in plegmon of the hand the author had no spread of the inflammatory process in the tendon sheath to produce a secondary tenosynovitis. Because no other complications of the immobilized hand such as ankylosed joints and tendons atrophy of the bone with pain and retraction of the palmar aponeurosis were seen the author advocates this form of treatment.

ARTHUR F. CIRIELLO, M.D.

Blaisdell, P. C.: The Healing of Open Pilonidal Wound. *J. Am. M. Ass.* 1947 133 916.

The author points out the confusion existing in pilonidal surgery regarding uncontrolled schemes of primary closure involving special suture materials and patterns, different ways of obliterating dead space and eliminating infection and prodigious preoperative preparation. Statistical analyses of recurrence rates and healing time are incomplete and susceptible to differences of interpretation and emphasis.

Open pilonidal wounds usually heal in every respect like normal granulating wounds elsewhere. Occasionally they may exhibit varying degrees of delay in healing independent of whether the wound was left open from the start or broke down following primary suture. Such wounds the writer calls distressed wounds.

The distressed pilonidal wound is a unique entity with distinct characteristics. The bony surface underlying the pilonidal wound is a convex curve, which curve is continued in the soft parts between the coccyx and anus. A lesion limited to the flat area over the sacrococcygeal joint lacks special problems but extension into the intergluteal cleft has many untoward features.

The most common cause of delayed healing and recurrence is incomplete operative removal of the lesion and is unrelated to any unique characteristics of the pilonidal wound itself. Incomplete removal is far more common than is realized. The pathologic report can be helpful in warning of missing portions and the error may then sometimes be rectified in postoperative office care but this is impossible in a sutured wound.

The chief untoward characteristic of the open pilonidal wound and the next most common source of recurrence is the tendency of both granulation tissue and skin to bridge across. This leaves a readily overlooked underlying channel which becomes a permanent sinus unless prevented or destroyed.

Clinically recurrence in the open wound is permanent delayed healing. In contrast recurrences following suture are apt to occur long after apparently satisfactory healing. This is a great source of error in the comparative statistics of recurrence following open and closed methods.

Bridging is undeniably related somehow to infection yet the control of bridging in the open wound is not dependent on the control of infection. Infection would be impotent were it not for the force of contraction on the uniting tissues in the cleft. The conversion of wounds with steep sides to shallow forms for the prevention of bridging is called "saucerization" and the tendency to bridging varies inversely with the degree of saucerization obtained. Saucerization is urgently needed in the intergluteal cleft yet desirable saucerization there would involve preposterous loss of the buttock. Thus meticulous postoperative diligence is necessary.

Undermined skin edges at the ends of distressed pilonidal wounds is a cardinal indication of trouble. To prevent it gradual slopes of the longitudinal ends of the wound should always be obtained. All that is necessary is a simple linear incision at both ends.

If one is confronted by an overhanging skin edge, the wound should be explored and restored under anesthesia. Retained sinus remnants and deep bridging should be disposed of. Excessive granulation is an effect rather than a cause of delayed healing. It always accompanies a retained sinus postoperative bridging and overhanging ends and recedes as they are counteracted. Excessive granulations also occur with the rubbing together of the opposing surfaces of the wound. This can be treated by applying flamed adhesive to the raw wound surfaces.

Infection is not a problem of the open pilonidal wound but frequently causes sutured wounds to break down.

In the discussion Rosser suggested that during the early days of healing the broad open wound should be protected from bacterial contamination and any avoidable physical injury. Tucker pointed out the similarity between principles of pilonidal surgery and fistula surgery. McGinnis argued for the closed method citing the added morbidity of the open method. Blaisdell, in closing emphasized that the recurrence rate after the closed operation was 20 times that after the open method.

S. LYOTZ TITTELMAN, M.D.

Rountree, P. M.: Cross-Infection of Wounds in a Surgical Ward during a Trial of the Use of Oiled Blankets. *Med. J. Austral.* 1947 1: 427.

A previous investigation by the author (and Army tags) in 1946 revealed the large bacterial load carried by hospital blankets. The use of oiled blankets in a general surgical ward was studied in order to determine whether such blankets would have any effect on the incidence of wound cross-infection.

The blankets were collected, marked distinctively, laundered and oiled before the commencement of the trial. One hundred and eight blankets were

used this number was considered likely to be sufficient for the duration of the experiment. The blankets were washed in the hospital laundry in the usual way in three batches of 36 blankets each, and after the final rinse were oiled with a "fixanol C" oil and water emulsion. This emulsion consisted of the following components: water 60 pounds, white oil, 15 pounds, fixanol C, 6 pounds. Twenty-four pounds of this emulsion mixed with water to give a 1 in 10 dilution were used for each load of 36 blankets. The average oil content on drying was 5 per cent and the concentration of "fixanol C" was calculated to be approximately 1 in 800. The treated blankets remained in continuous use during the 4 months period of the trial. Since the number of blankets on any one bed is often altered, it was not practicable to arrange for the exclusive use of a set of blankets for each individual bed. All oiled blankets therefore came out of and were returned to the common pool as the occasion required.

At the conclusion of the trial samples were taken from unused oiled blankets stored in the linen cupboard from oiled blankets on 10 different beds in the male ward and from unoiled blankets on 10 different beds in the female ward. The unoiled blankets may or may not have been in use as long as the oiled blankets, but serve as a typical sample of the normal hospital blankets. These samples were examined for their total numbers of bacteria per gram of blanket and for the presence of hemolytic streptococci.

Swabs were taken from the wounds of all patients the day before the commencement of the trial and thereafter at intervals of 1 week during the course of the test. In a few cases, more than a week elapsed between operation and the first removal of the dressing. In such cases the wound was swabbed when the dressing was removed. The swabs were plated on blood agar and incubated aerobically. Organisms isolated were identified as completely as possible. Hemolytic streptococci were grouped but not typed. All staphylococci were examined for coagulase production and, as far as possible with the range of phages available for phage type according to the method of Wilson and Atkinson (1945).

During the trial the ward dust was examined for the presence of hemolytic streptococci and coagulase-positive staphylococci. Bacterial counts were also taken of the air in the male ward during bed making and sweeping.

Air samples taken in the male ward during bed making supplied confirmatory evidence of the value of the oiling process in reducing the bacterial load in the blankets and so indirectly in the air. A count of 134 organisms per cubic foot of air was obtained under conditions similar to those which had previously given a count of 636 however as soon as sweeping commenced in the ward the count rose to 634 organisms per cubic foot of air.

The wounds examined included all types of general surgical wounds. The majority were in such positions that they could be considered clean surgical wounds but a number of cases included such

conditions as chronic empyema sinuses, varicose ulcer third degree burns, excisions of fistula in ano, and pilonidal sinus. Such wounds were classified as "dirty" wounds.

In the cases of "clean wounds, cross-infection was considered to have occurred if the first swab, taken a week after operation, yielded a culture of micro-organisms, if a culture followed a previously unsuccessful attempt at obtaining a culture, or if another type of organism appeared in a wound already yielding bacteria.

In the case of the "dirty" wounds, the criterion of cross-infection was the appearance in the wound of another type of organism. In 3 cases, infection was apparent at the first removal of the dressing after operation and may reasonably be assumed to have occurred in the operating theater. In the remaining cases the infections are assumed to have taken place in the ward and in many of these there is convincing evidence that this is what had actually occurred.

The most frequently occurring organism was the staphylococcus, and if coagulase production is taken as a criterion of pathogenicity pathogenic staphylococci were recovered from 18 wounds in the series. There were only 3 cases of infection with group A hemolytic streptococci. In general, the other organisms isolated cannot be considered wound pathogens, but their isolation from surgical wounds can be taken as an index of the presence of conditions which permit the transference to such wounds of bacteria, including potential pathogens.

Nose and throat swabs were taken from the serving staff of the ward. Coagulase-positive staphylococci were isolated from 5 of 24 nose swabs and from 1 of 14 throat swabs. These were typed and it was found that two of the nurses were nasal carriers of the type 5b organism. The noses of these nurses were swabbed at weekly intervals in the following weeks and they were found to be persistent nasal carriers of this type. A point which seems of considerable importance in elucidating the origin of the cases of wound cross-infection with this type is the fact that these two nurses were senior nurses who were responsible for the dressing of the wounds of the patients.

The fact that 3 of the patients infected with this organism were also found to be nasal carriers may possibly indicate that the infection in these cases was autogenous. On the other hand, other infected patients did not carry the organism in their noses and it seems more likely that the nasal strains were implanted during the patients' stay in the ward. A further point which supports this presumption is the fact that all type 5b strains isolated in the ward were penicillin resistant.

The efficacy of the "fixanol" and oil treatment in reducing the bacterial load of blankets is illustrated by the bacterial counts obtained with the blankets in this investigation. In reports by the Commission on Acute Respiratory Diseases and the Commission on Air Borne Infections (1946) it is stated that oiling of blankets reduced the numbers of bac-

teria released by 90 to 95 per cent. It would appear that treatment with formalin and oil not only reduced the numbers of bacteria releasable from the blankets but also resulted in the actual destruction of a large proportion of the micro-organisms deposited on the blankets in the secretions of the patient. However it is apparent from the incidence of wound cross-infection during the trial that oiled blankets used alone and without other dust control measures had no effect on the control of cross-infection under the conditions obtaining in the ward during the investigation. This investigation has once more emphasized the complexity of the problem of cross infection of surgical wounds. The evidence available suggests that in this trial infective particles from the blankets played little part in the production of cross-infection. The role of dust infected from other sources—for example from the bed linen or directly from the skin and nasopharynx of patients—is difficult to assess. It appears that some of the nursing staff directly or indirectly may have been responsible for a proportion of the staphylococcal infections.

BENJAMIN GOLDMAN M.D.
St. Louis, Mo.

Silverthorne N: Tetanus. *J Pediat* 6 Louis, 1947

This is a study of 77 pediatric patients afflicted with tetanus during the years 1951 to 1956 and represents a summary of the clinical observations, treatment, epidemiology and prognostic indications. Most of the cases occurred during July and August and September. The majority of the patients were between the ages of 3 and 13 years of age. There were 53 males and 24 females. Some type of trauma could be related to most instances but in 15 of the 77 there was no history of cut, scratch, or puncture wound. The incubation time varied from 1 day to 1 month, and it was observed that the shorter this period was the more seriously ill the patient. Of greater significance was the length of the invasion stage; the shorter this period, the more likely the patient was to succumb. Active immunization for children is urged.

Proper treatment should consist of quiet in a darkened room with constant nursing attention. Intravenous fluids when oral feedings are contraindicated, prompt intramuscular administration of an antitoxin in doses varying from 40,000 to 300,000 units, according to the severity of the disease, penicillin when necessary for secondary infections, sedation, the author preferring seconal and cleansing of the wound, but not excision as several patients became worse following this procedure.

A general fatality rate of 47 per cent was found. For the last 10 years alone the fatality was 38 per cent. This improvement is attributed to better principles of treatment, especially the route of antitoxin administration. The author recommends that tetanus antitoxin be given intramuscularly and advises against its intravenous or intrathecal use. Evidence suggests that in recent years this disease has become considerably less severe.

C. FREDERICK KITTLE, M D

Cozar B S: Generalized
mus (Féltanos generalizad
españ. cir., 1946 5 141

Convulsions set in which was typical and complete in every respect for evidence of trismus. Trismus is considered a cardinal symptom of tetanus but has no satisfactory explanation.

Trismus is considered by the author as a symptom of tetanus and the author has no satisfactory explanation of the phenomenon observed in his patient. The different theories regarding the manner in which the tetanus toxin is absorbed and its mode of action are discussed at length.

STEPHEN A. ZIEGLER, M.D.

Long, A. P. and Sartwell P E: Tetanus in the United States Army in World War II Bull U S Army M Dpt 1947 7 371

United States Army Medical
Army Medical Department 1947 7 571

In the army prior to 1941 tetanus prophylaxis consisted of antitoxin administration to all men whose injuries seemed to warrant it. The major drawbacks of this measure are that (1) it may not always be possible to provide the prophylactic injection of antitoxin and (2) there is a hazard of hypersensitivity reaction.

... obtain or fluid tetanus toxoid has been ... for the prevention ...

Since 1941 plain or fluid tetanus toxoid has been used as the immunizing agent for the prevention of tetanus. This type rather than the alum precipitated tetanus was chosen because the British and French demonstrated its efficacy and safety and its sensitizing properties were less.

The administration of toxoid was based on the principle of establishing a basic immunity and reinforcing it by stimulating injections of the toxoid. All military personnel were given a basic immunization of three subcutaneous injections of 1 c.c. of tetanus toxoid at intervals of 3 weeks. Routinely at yearly intervals 1 c.c. of a toxoid stimulating dose was given, and emergency stimulating doses of 1 c.c. of toxoid were given when wounds or other injuries likely to lead to tetanus were incurred or upon manipulation of old wounds considered to be potentially contaminated by Clostridium tetani.

Studies were carried out by measuring circulating antitoxin levels after the administration of tetanus toxoid. It was shown that immediately after the initial series adequate protection existed and there was no need for prophylactic antitoxin. Additional studies were carried out to determine how long basic immunity (sufficient to allow for an adequate response to a stimulating dose) will persist. Adequate response to a booster dose of toxoid was observed for a period of at least 3 years after the basic immunization and 2 years after the routine stimulating dose. It is suggested that this protection probably con-

times for a considerably longer period. However it still would appear wise to continue the administration of emergency stimulating doses of toxoid following injury and it appears that the adequate response develops well within the usual incubation period of tetanus.

Reactions to toxoid are few and may be of two types. The first nonspecific in nature may result in local soreness at the injection site, headaches, general malaise and occasionally chills and fever. The second type is characterized by the early appearance (within 30 minutes after injection) of flushing, itching of the skin, urticarial eruptions and occasionally edema of the lips, eyelids or glottis. It is believed that reactions of this type were due to hypersensitivity to a previous dose. Following discontinuance of the use of certain toxoids with peptone components reactions dropped to less than a per 100,000 injections. Initial sensitization with the materials in current use appears to be almost nonexistent.

During World War II 13 cases of tetanus occurred among Army personnel including 4 cases resulting from injuries sustained prior to entry into active service. Only 1 case of tetanus resulted from a battle injury the other cases resulted from accidents. Penetrating injuries of the extremities were the most common cause. Six of the 13 patients had received no immunization at all, 1 had had basic immunization but no emergency stimulating injection and 4 had had basic stimulation plus an emergency stimulating injection. There were 3 fatalities in this group and the incubation period in the fatal cases was slightly less than 7 days.

During World War I the Army reported 13.4 cases of tetanus per 100,000 wounds and injuries. During the period from 1920 to 1931 there were 2.4 cases per 100,000 and during World War II 0.44 case per 100,000 a drop in frequency to 1/30 that for World War I.

From a study of the incidence of tetanus in the enemy forces and among civilians injured in military operations it is evident that without the benefit of toxoid a considerable number of cases of tetanus might well have occurred in our troops. By avoiding prophylactic antitoxin a considerable number of serious serum reactions were prevented.

The average mortality rate among American civilians from 1936 to 1938 for all age groups was 0.76 per 100,000 population per year. There has been a steady decline in tetanus mortality over many years, probably as the result of better surgery and an increased use of antitoxin. In the authors' opinion it is doubtful whether toxoid is in use on a sufficiently wide scale to have any great effect on civilian mortality.

During the war the British reported 35 cases of tetanus due to battle injury among 289,649 wounded men. In addition they found 18 cases in troops who had sustained nonbattle injuries. Boyd noted that the incubation period was shorter in the actively immunized personnel who developed tetanus, and an inadequate level of circulating antitoxin in the early

stages of infection was the cause of failure of immunization in these cases.

War experience proves the efficiency of this Army procedure for the prevention of tetanus. Reliance was not placed on a continuing state of immunity following immunization but rather advantage was taken of the rapid rise in blood antitoxin levels which occurs soon after the administration of a stimulating dose.

Active immunization should be carried out in civilian practice, particularly in the cases of children and adults whose activities are such that infection with *Clostridium tetani* may be seen. Such individuals should be furnished with a record of the procedure so that physicians subsequently treating their injuries may know that the administration of toxoid, and not antitoxin, is the prophylactic treatment of choice.

The alum precipitated toxoid lends itself to use in children in combination with other antigens such as diphtheria toxoid. Fluid toxoid, because of its more rapid absorption, may be the agent of choice for the booster dose.

In the case of an ex-serviceman stating that he was in the Army for at least a year subsequent to Pearl Harbor it would be reasonably safe to administer toxoid rather than antitoxin prophylactically. Such military service would almost certainly mean he had at least received his basic tetanus immunization; hence he could be expected to respond satisfactorily to a stimulating dose of toxoid.

ROBERT R. BENTON, M.D.

Sorensen, A. I. Chronic Meningomyelitis following Intraspinal Tetanus Antitoxin Therapy for Tetanus (Contributo allo studio delle complicanze croniche post-tetaniche del tetano. *Meningomyelite cronica insorta dopo microterapia antitetanica*). *Polidiolo* sez. prat. 1937 II 38.

A patient was cured of tetanus following the administration of tetanus antitoxin by means of the intraspinal and intramuscular routes. One month later she developed a spastic paralysis, with disturbance of sensation and loss of sphincter control. Characteristic myelographic studies showed an obstruction in the ninth dorsal vertebra.

A laminectomy was performed from the 4th to the 7th thoracic vertebra, which revealed a plastic leptomeningitis, attached tenaciously to the spinal cord. This produced a transitory amelioration of the symptoms, which recurred when a second laminectomy was done on the last thoracic and the first lumbar vertebrae. Vascularized chronic adhesions were found. The patient's condition became worse a high fever was present, and finally death occurred, approximately 3½ months following the onset of the condition.

The author concludes that the chronic meningomyelitis was due either to the tetanus toxin or to an antiphylactic reaction to the tetanus antitoxin.

ARTHUR F. CROSSLAND, M.D.

ANESTHESIA

Hellijas, C. S., Tovell R. M. and Holt, K. R.: Analgesia and Anesthesia in Obstetrics. *Anesthesiology* 1947 8 113.

The application with the greatest safety of any agent or method to the production of obstetric analgesia and anesthesia requires proper evaluation of the status of the prospective mother in the antenatal period, close co-operation of the obstetrician and anesthesiologist and a degree of flexibility of plan of action which will permit alterations of procedure when required.

The opiates have, to a great extent, been replaced by less depressant drugs, the most popular of which are demerol and selected derivatives of barbituric acid. Scopolamine has been the agent recently employed. Most of the combinations administered by the rectal route are still extensively employed. Mixtures of ether and oil or other paralytic and oil in conjunction with pentobarbital sodium have been advocated as has a combination of paralytic and hexyl alcohol. The barbiturate series has received a modest trial by the rectal route either as the sole agent or as an addition to rectal anesthetic mixtures. Nembutal and secobarbital dispensed in capsules act promptly following administration in this manner.

The efficacy of cyclopropane has been demonstrated. It has steadily replaced the more common anesthetics given by inhalation. Local regional and spinal anesthetics are advocated by a relatively small number of proponents. The employment of continuous caudal analgesia has served to demonstrate its usefulness in selected cases. The failure of its general applicability to obstetric practice has become evident.

At the present time at the Hartford Hospital, Hartford, Connecticut, amnesia and analgesia are most often produced by the use of a combination of nembutal, secobarbital, or sodium amylal with scopolamine. The combination of demerol and scopolamine has proved as satisfactory as the barbiturate-scopolamine medication. Continuous caudal analgesia for relief of pain during labor and for eventual delivery was employed in relatively few cases.

Since 1936 the most prominent developments have been the marked increase in employment of cyclopropane for obstetric purposes and the growing popularity of spinal anesthesia for the performance of cesarean sections. In 1945 83 per cent of cesarean sections were performed with spinal anesthesia as the basic method of choice and cyclopropane was used as the sole agent in more than 95 per cent of the cases in which an inhalation anesthetic was administered.

The increased employment of the agents for amnesia, analgesia, and anesthesia now in active use in this hospital has contributed in a most creditable manner to a decrease in fetal mortality and maternal morbidity. Two other factors must be presented to realize a true perspective of the overall decrease in

fetal and maternal mortality. These are the greater incidences of cesarean sections and forceps deliveries. MARY FRANCES POPE, M.D.

Green, H. N., Harbord, R. P., and Others: Discussion: Shock with Special Reference to Anesthesia. *Proc. R. Soc. Med., Lond.*, 1947 40 167.

In the present discussion Green stated that between general anesthesia and shock there are superficial resemblances. Observation of the anesthetic states seen in advanced adenosine triphosphate shock led the author to consider a possible relationship between the two states. Though it is not known in what way anesthesia and shock are precisely related, the view that they are supplementary rather than complementary states seems plausible.

It does not follow that, because the shocked individual requires less anesthetic, anesthesia necessarily predisposes to shock and in fact it would seem that the reverse hypothesis has more in its favor. It must be concluded that afferent nerve impulses do play some part in the complicated genesis of shock and therefore that local and regional anesthesia have some place in shock prophylaxis. Every manifestation of shock has as its outcome the conservation of body energy and fluid. Provided that the secondary toxic effects are avoided it may well be that anesthesia may actually be beneficial in reinforcing a general defense mechanism to injury. This does not mean that clinical shock is a desirable state but up to a certain point shock must be a beneficent reaction. We have no accurate measure of the safety limit.

Clinical shock is the expression of large-scale tissue injury and the treatment is solely that of restoring the injured parts to normal. In the final analysis anesthesia is the most potent weapon that we have in the prophylaxis of shock for with it damaged tissue can be removed or restored which would otherwise remain to kill.

The anesthesiologist ought to become the recognized expert in clinical shock. He has the best facilities for assessing the degree of shock and he is most directly concerned with the degree of tissue oxidation.

Harbord stated that the present confusion of thought regarding the best anesthetic for shock is because of the lumping together of various illnesses under the term "shock." This paper is based on a study of the responses of a standard type of patient under similar conditions, and covers a part of the material collected by No. 1 Traumatic Shock Research Team during the war.

In limb injuries the illness of the patient depends mainly upon hemorrhage. The signs found at operation depended upon the amount of damaged tissue dependent upon the amount of damaged tissue remaining adherent to the body. In belly injuries the same was true but to a lesser extent. Other factors caused an alteration in the signs at operation. Pressor and depressor responses were observed in both limb and belly cases.

The evidence shows that there is often a pressor effect at operation which is due to the anesthetic.

It was most probably due to a change in the carbon dioxide stimulus. The significance is that a false interpretation is obtained concerning the state of the patient: the pressor effect may reflect an additional circulatory strain and the period immediately following the removal of the mask is potentially dangerous. Other effects of anesthesia depended upon the drug employed.

With ether and cyclopropane a well marked vasodilatation occurred while with pentothal anesthesia little alteration was observed. Since it is a change imposed upon the patient by anesthesia, it may in fact be an adverse effect. It was found that the doses of anesthetic drugs in these patients were what would have been expected in normal patients undergoing similar operations. It appeared that the skill in administration was more important than the choice of anesthetic when comparisons were made between pentothal ether or cyclopropane.

MARY FRANCES FOX, M.D.

Wikle, H. T. and Ryan, R. J. Convulsions Occurring under Anesthesia. Analysis of 6 Cases. *Am J Surg* 94:7 73-83.

Convulsions during anesthesia are rather uncommon but it is important for physicians to be on the alert to treat these convulsions, and to prevent their

occurrence if possible. Convulsions during anesthesia were encountered 6 times in one year during which 2,143 anesthetics were administered on the surgical service of the Cumberland Hospital, Brooklyn, New York.

The etiology is extremely vague. The literature is replete with reports of possible causes, many of which contradict each other thereby making the situation more confusing.

Despite lack of knowledge concerning the operative factors, strict attention should be given to the preoperative care of patients, particularly those who are acutely ill and toxic. In an effort to lessen the number of convulsions during anesthesia. The reported incidence of convulsions associated with spinal anesthesia is negligible compared to that with inhalation anesthetics. It is worth while to consider the use of spinal anesthesia in these toxic patients.

The authors recommend the prompt use of sodium pentothal as advocated by Landy. Heretofore, the mortality in patients having convulsions during anesthesia was extremely high. With sodium pentothal at hand, this figure should be lower. There was only one death among the six patients herein presented and this was attributable not to the convulsion but to hepatorenal failure on the fifth postoperative day.

MARY FRANCES FOX, M.D.

PHYSICO-CHEMICAL METHODS IN SURGERY

ROENTGENOLOGY

Hunt, H B : Cancer of the Eyelid Treated by Radiation; with Consideration of Irradiation Cataract. *Am J Roentg* 1947 57 160.

The author presents a survey of cancer of the eyelid based on 100 cases selected from a group of 134 cases. The distribution of cancer of the eyelid according to sex shows a somewhat higher incidence in men—66 men to 34 women. Cancer of the eyelid usually begins first as a small nodular thickening or elevation located directly adjacent to the lid margin. The lesion enlarges and extends very slowly as a rule.

The cancer lesion shows a predilection for the medial portion of the lower lid and the area about the inner canthus, about four-fifths of the lesions occur in this combined area. In the present series, 48 per cent of the lesions occurred along the lower lid and 34 per cent about the inner canthus with only 6 per cent along the upper lid and 12 per cent adjacent to the outer canthus.

Carcinoma of the eyelid extends primarily by direct infiltration. Basal cell carcinoma may extend subcutaneously or may permeate locally along adjacent lymphatics. Advancing carcinoma of the eyelid may travel through the lymphatics, penetrate the orbital fascia, and give rise to intraorbital metastases. Lesions about the inner canthus tend to invade the lacrimal duct. Inner canthal lesions may spread across the base of the nose to the opposite inner canthus. Squamous cell carcinoma of the eyelid, although not common is a more serious lesion, shows greater local invasion and frequently metastasizes to the parotid or submaxillary glands.

The problem of postirradiation cataract is of paramount importance to the radiologist in the treatment of carcinoma of the eyelid by roentgen rays or radium.

The author has found an eyeshield, developed by Wölfflin to be satisfactory. It is composed of lead, 1/2 mm. in thickness and is plated with nickel for absorption of the characteristic radiation of the lead. This shield, however is not satisfactory for gamma irradiation.

The treatment applied in this series of 100 cases varied in type and combination according to the individual problem, and according to our maturity of experience at the time. Roentgen therapy was employed in 92 cases, radium therapy in 11 cases, and electro-surgical procedures in 12 cases. Further analysis shows that roentgen therapy alone was employed in 80 cases, radium alone in 3 cases, radium and roentgen rays combined in 5 cases, electro-surgery and roentgen rays in 7 cases, electro-surgery and radium in 3 cases, and electro-surgery alone in 2 cases. Roentgen therapy has now become the author's radiotherapeutic method of choice due to its proved

effectiveness accuracy simplicity and restriction of exposure more closely to the diseased area. Fractionation of treatments is advantageous in lesions of over 3 or 4 mm. in thickness in roentgen therapy. Roentgen radiation energized by 70 kilovolts (peak) is used for small and superficial lesions. In lesions over 3 or 4 mm. in thickness radiation energized by 90 kilovolts (peak) is used, while lesions infiltrating the lid are treated by 130 kilovolts (peak) of radiation using a filter of 0.25 mm. of copper and 1 mm. of aluminum. Deep infiltrations of the orbit are treated by 200 kilovolts (peak) using 0.5 mm. of copper or Thorium filter. Surgical ablation of large elevated carcinomas of the eyelid prior to roentgen therapy permits more effective radiation.

Four of the 100 patients whose cases are reviewed have died from cancer of the eyelid during the past 15 years. Therapeutic failures result from (a) advanced and inaccessable disease (b) impairment of the tumor bed by prior inadequate therapy (c) in sufficient or uneven dosage (d) incomplete follow up coverage of the lesion and (e) inadequate therapy of patients. In general, superficial roentgen therapy is very effective in the eradication of cancer of the eyelid with maximal preservation of the uninvolved tissues and with minimal injury to the eye when properly protected by an eyeshield.

FRANK L. HURLEY M D

Windholz, F : Reactions of Connective Tissue after Protracted Fractionated Irradiation of Laryngeal Carcinoma. *Radiology* 1947 48 148.

The author is chiefly concerned with connective tissue reactions as they occur after protracted fractionated irradiation. The studies were made on structures of the larynx which were irradiated because of the presence of carcinoma. In the present study the microscopic findings observed in from 1 month to 10 months after protracted fractionated irradiation are described in detail and interpreted. Numerous photomicrographs are used in the text to illustrate the various points of interest. The studies show that contrary to former belief there are profound and extensive early and late changes in the connective tissue after protracted fractionated irradiation of the larynx. These changes occur in three stages.

The first stage corresponds to a homeostatic retrogressive period which coincides with fibrinous cells of mucositis and disintegration of the epithelial cells of the mucous membrane. In this stage the most important manifestations are the exudation of fibrin and partial or complete loss of nuclear staining, and the frequent modifications in the microchemical reaction of the subepithelial collagenous fibers.

The second stage is characterized by a hypoplastic regenerative activity. Connective tissue replaces the destroyed carcinoma. The fibrinoid necrosis leads

to a regenerated connective tissue with hyaline sclerotic layers throughout the area of irradiation. This is associated with diffuse atrophy of the mucosa laryngeal glands, fat tissue and even muscles. The blood vessels are often obliterated, and the remarkable thing is that veins are more profoundly affected than arteries. The inflammatory reactions of the regenerated connective tissue are greatly reduced.

A third retrogressive stage is observed in those instances in which the irradiation was too heavy or in which the individual sensitivity of the connective tissue is higher than average. In such cases the mucosa ulcerates, the newly formed connective tissue breaks down and secondary infection follows with deep necrosis of the irradiated larynx.

It is the author's contention that the advantage of the protracted fractionated irradiation as compared to the massive irradiation given in a short time, is the fact that retrogressive and regenerative processes develop under the influence of a prolonged flow of the radiant energy. It is assumed that the loose normal connective tissue is transformed into a hyaline sclerotic connective tissue with few cells and sparse blood vessels, which is more resistant to the irradiation and consequently will tolerate a larger total dose without disintegration.

This new connective tissue also influences the general nutritive condition of the larynx, mainly in the areas near the lumen. The perichondrium which has a selective radiosensitivity because of its closed blood supply system, may be particularly affected and result in perichondritis and edema.

T. LECOTTE, M.D.

Windholz, F.: Late Changes in Mucous Membrane of the Irradiated Larynx. *Radiology* 94:7 43 374.

In his second article the author deals mainly with the changes occurring in the epithelium of the larynx following protracted fractionated irradiation. The studies are based on microscopic examinations of the mucous membrane of the larynx, made in from 1 month to 10 months after irradiation for carcinoma. The average tissue dose was 5,800 roentgens, and the treatment was administered with 200 kilovolts, Thoracur filter 8 x roentgen min. and 6 by 6 centimeter size fields. Again numerous photomicrographs are used for the purpose of illustration.

The studies reveal that the primary effect of irradiation is cell destruction. Coutard observed as early as 1922 that the epithelium of the larynx is destroyed in approximately 13 to 18 days and that the mucous membrane has regenerated in 26 days after the first irradiation. In a similar manner the author found that at the time fibrinous reaction occurs, the mucous membrane is entirely destroyed. Remarkably, when regeneration of epithelium takes place, not only the squamous cell epithelium but also the normally high columnar ciliated epithelium is transformed into a fully differentiated epidermoid epithelium exhibiting various degrees of cornification. The author was able to demonstrate the same

type of metaplasia experimentally on the irradiated larynx of guinea pigs, which were given a tissue dose of 5,000 roentgens by the protracted fractionated method during a period of 4 weeks.

The structure of the regenerated epithelium varies according to the postirradiation condition of the subepithelial connective tissues. In areas in which the subepithelial connective tissue shows an advanced hyaline change with marked scar formation, the epithelium is reduced to two to three layers, and has a very atrophic appearance. It is notable that in 2 cases out of 10 in which atrophy of the epithelium coincided with an abundance of hyaline sclerotic connective tissue, the carcinoma disappeared clinically as well as microscopically. In 2 other cases with recurrence of the cancer the epithelium was very thick and resembled the picture of a precancerous state of the epithelium, and the connective tissue appeared remarkably well preserved.

It is, therefore, the author's conclusion that after the primary epithelial reaction subsides the changing generations of the metaplastic epithelium adapt the growth and differentiation properties of their structures to the postirradiation condition of the subepithelial connective tissue.

T. LECOTTE, M.D.

Cottoni, F.: Observations on the Deep Cervical Fascia in Man. Contribution to the Study of Retropharyngeal Abscess Secondary to Tuberculous Spondylitis of the First Cervical Vertebra (Osservazioni anatomico-radiologiche sulla fascia cervicale profonda dell'uomo. Contributo allo studio dell'ascesso retrofaringeo da spondilite tubercolare delle prime vertebre cervicali). *Radiol. ital.* Milano, 1947 33 49.

Cottoni reports a case of retropharyngeal abscess due to tuberculous spondylitis of the second cervical vertebra, with anatomical studies performed upon cadavers of varying ages and both sexes for the purpose of explaining why extension in the case reported should have been in the direction of the pharynx rather than toward the posterior mediastinum, a prevailing anatomical concept would suggest.

He found that the close adherence of the deep cervical fascia anteriorly to the posterior wall of the pharynx, from the base of the skull to the fourth cervical vertebra and to the body of the third cervical vertebra, along with the insertion of the long muscles of the neck, serves to obstruct the cranial diffusion of abscesses forming in connection with the anterior portions of the first 3 cervical vertebrae and the occipital condyles.

EDWIN B. FARRINGTON, M.D.

Andersen, E., Gammelgaard, A., and De Flow Licht, E.: Hypertrophy of the Pylorus in Adults. *Acta radiol.*, Stockh., 94:6 7 357.

The authors review the literature on hypertrophy of the pylorus in adults, and present 8 cases found in 16,000 individuals in whom the stomach was examined roentgenologically during the period bet. 1900

PHYSICO-CHEMICAL METHODS IN SURGERY

1934 and 1944 at the County Hospital Gjøtøfte, Denmark.

The first 2 cases of hypertrophy of the pylorus in adults were reported by Landerer in 1879 and the authors have found 167 cases reported in the literature since then 71 per cent of them males, the age of recognition ranging from 12 to 80 years. The largest group of cases (81) was reported by Kirklin and Harris of the Mayo Clinic, in 1933 65 of the patients were males. The ages ranged from 21 to over 60 years of age rather evenly distributed by decades the largest number of patients being from 41 to 50 years of age. Preoperative diagnosis was made in only 2 of 169 cases.

The symptomatology is the same as in pyloric stenosis from other causes vague in mild cases and consisting of a slight sensation of pressure in the epigastrium after meals, more pronounced in the rarer severe cases with pain and, at times, vomiting after meals. The vomiting usually relieves the pain but the patient begins to lose weight and in the worst cases cachexia, anemia, and dehydration may ensue. The onset of symptoms is slow measured in months and years with a tendency to long intermissions. Hematemesis, melena, or occult bleeding is uncommon but has been found to occur in some cases. Ewald test meal gives normal values. In thin patients a mobile plum-sized mass may be palpable to the right of the spinal column at the level of the second to third lumbar vertebra.

The pathoanatomic change consists in hypertrophy of the circular muscular coat of the pyloric region extending from the sphincter (but either not or only slightly) involving it) proximally into the antrum for 3 to 5 cm. This finding is similar to that described in infants with pyloric hypertrophy and Crymble and Walmsley believe the adult condition to be merely a delayed expression of the infantile condition. Rönström, who followed (for years) 107 cases of pyloric hypertrophy in infants roentgenologically found that some narrowing of the channel persisted long after clinical manifestations had subsided he noted that usually not until the age of 4 the slight peristalsis becomes visible across the involved area and pointed out that at any time the gastric mucosa became swollen by hyperemia, edema and inflammatory infiltrate the relatively narrow canal would be compromised and symptoms would reappear. The authors believe that a similar mechanism probably operates in adults with recurrent symptoms and the 3 cases they had opportunity to study microscopically showed increased cellular infiltration of the mucosa superimposed on hypertrophy of the musculature of the juxtapyloric canal.

On roentgen examination the normal pyloric canal is 0.8 to 1 cm long whereas in cases of hypertrophy it measures 2 to 4 or 5 cm, has a smooth funnel shaped contour widest orally is straight if only 1 to 3 cm long but if longer it is likely to be convex toward the site of the lesser curvature and tends to terminate at the base of the duodenal bulb. Under low fluoroscopic observation the narrow canal

reveals changes in width and contour retains its fold pattern in relief view and in some cases may show just inferior to its midpoint a little prominence corresponding to the cleft between the sphincter and antral musculature oftenest on the greater curvature and distinguishable from crater by the radiance with which the contrast material is evacuated.

The authors present 8 cases which fulfilled many or all of the above roentgen criteria. Six of the patients were men. The average age was 60 years, the ages ranging from 53 to 77. Six of the patients had dyspeptic symptoms for a number of years, 1 had had symptoms for only 3 months and 1 had no distress. Vomiting had occurred in 4 cases and a positive benzdine reaction was obtained in 2. Six of the patients were operated upon and the 2 others have been under observation for 5 and 9 years, respectively. At fluoroscopy variation in width of the concentrically constricted and elongated pyloric lumen was seen in each of the cases barium being propelled through the narrow channel by peristaltic like contractions, and the authors believe this variation in channel width to be the most reliable sign in differentiating adult hypertrophy of the pylorus from the rigid motionless canal encountered in cases of prepyloric cirrhous carcinoma in which barium flows through in an even stream as through a pipe. In 5 cases longitudinal rugae were visible in the narrowed portion but it was recognized that folds may persist for some time in cases of cirrhous carcinoma. Six cases showed the small barium projections referred to above but these were inconstant in a given patient at different examinations. Six cases revealed a mild grade mushroomlike defect of the bulb base and a mobile plum sized mass was palpable in those cases in which the abdominal wall was not unusually thick.

The authors are of the opinion that the differential diagnosis between adult hypertrophic stenosis and juxtapyloric chronic peptic ulcer with flat niche is aided not only by the tendency of the latter to retain barium longer than the small cleft, but also by the frequently eccentric location of the pyloric canal as it is drawn toward the lesser curvature by cicatrix in such old ulcer cases. They believe that when all these points are kept in mind it is possible to differentiate adult hypertrophic pyloric stenosis roentgenologically from other more serious conditions, in a fair percentage of cases and thus to avoid exploration unless stenotic phenomena require relief.

LILIAN DONALDSON M.D.

Pezalut, Z. M.: Radiation Sickness in Patients Undergoing Irradiation Therapy for Cancer of the Uterine Cervix. Clinical Analysis and Study of the Therapeutic Action of Psychergline (II) male da razi nelle pazienti irradiate per cancro del collo dell'utero. Analisi clinica e studio sulla azione terapeutica della psichergina. (I) (II) metilaminopropano II. *Fed. 278* Genova 1945, 41-373.

During the years from 1931 to 1942 at the gynecological and obstetrical clinic of the University of

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Pavia, 247 patients were treated radiologically for cancer of the uterine cervix. This number represents 2.52 per cent of all the patients with gynecological conditions observed during this period. Disturbances of a general character arising during the period of irradiation therapy were noted in 138 of these patients (55.86 per cent) in 105 cases (42.5 per cent) the manifestations were of a trifling character but in 33 (13.3 per cent) they were severe. The combined method, employing radium internally and roentgen radiation externally was used. The radium treatment was given by the continuous irradiation method of Régnard and Lacazeigne 4,800 mgm. hr. through the uterus and the same amount through the vagina. The roentgen treatment was given by the Coutard method, a total of 8,000 roentgens through 4 fields (2 anterior 2 posterior) at a distance of 50 cm.

In the material studied the predisposition to irradiation sickness seemed to be greater the higher the patient was on the social scale. Thus the author ascribed to the greater intelligence of this class, both as to the powers of apprehension and appreciation. The greatest incidence of the disease occurred during the fifth decade or the period of the menopause however the sickness was quite prevalent all during the period of sexual maturity and the author believes this was due to the greater effect of the endocrine activity on the neurovegetative system during this period and particularly to the disturbances in the reciprocal physiological mechanisms in the menopause added to the disturbances following the treatment itself. An odd finding was that the condition of parity did not seem to produce any predisposition to the attacks, nor did concomitant morbidity of the sexual organs have any noticeable effects, except for a seeming increase in the predisposition in the pres-

ence of both cancer of the cervix and fibroids of the uterus. As would be expected, however the tendency toward the attacks increased according to the irradiation sensitivity of the new growth, being greatest in the epithelioma basocellular type of cancer. Also the length of time during which the tumor growth had been present had an effect, which was probably linked with the greater physical deterioration of the patient in the more advanced stages of the growth. The attacks also seemed to depend upon the amount of diffusion of the cancerous condition. As one would expect, the sensitivity of the patient increased with the duration and amount of irradiation treatment. When radium alone was used, the disturbances occurred in only about a third of the cases and they were light in character but when both radium therapy and roentgen therapy were used the severity of the attacks seemed to vary almost exclusively with the roentgen dosage applied.

The general resemblance of the manifestations of irradiation sickness to a neurovegetative disturbance suggested treatment with the sympathomimetic amine pyrythene (a benzodrine derivative). Following the use of this drug 37 patients presented complete regression of the digestive tract, secretions (disturbances of the digestive tract, secretions of weakness, and depressive mental states). The insomnia and headaches were not manifestly increased, but were even increased however the latter could be controlled by sedatives, such as the barbiturates, valerian, and bromides, and the latter by reduction of the amount of the drug given. This presented no problem as the condition improved rapidly enough, as a rule, to permit prompt reduction of the dosages in 2 or 3 days.

JOHN W. BARRETT, M.D.

MISCELLANEOUS

CLINICAL ENTITIES—GENERAL PHYSIOLOGICAL CONDITIONS

Muller, W. H., Jr. and Harkins, H. N.: Malignant Soft Tissue Tumors of the Lower Extremities: A Radical-Conservative Technique of Wide Excision and Skin Grafting without Amputation. *Surgery* 1947 31 245

A method of treating certain malignant tumors of the lower extremities by wide excision followed by skin grafting is presented. The technique is not advocated as a substitute for amputation nor is it felt that the percentage of cures will be as high with this technique as with amputation. It may however be applicable in those cases in which amputation is refused. While the method may be used in the treatment of any type of malignancy it is believed that it can best be used for the more slowly growing fibrosarcomas, liposarcomas, and myxosarcomas. This group comprises a relatively small proportion of malignant neoplasms however they are amenable to less radical surgery because they are slow growing, infiltrate locally, and are slow to metastasize.

An incision is made about the tumor in such a manner as to include a very wide margin of skin. The incision should extend down through the subcutaneous tissue, and an even larger area of fascia should be removed. If the tumor involves the muscles these should be excised to an equally radical degree. Frozen sections from the periphery of the excision may be of value in determining the adequacy of removal. If it is found that such structures as the sciatic nerve or great vessels are involved after excision the operation is indicated. Immediately after excision the wound is covered with split skin grafts. Postoperative x-ray therapy to most of these tumors is considered of little value. Five cases have been treated by this method the elapsed time since operation being from 5 to 24 months. FRANK F. KAKTAK, M.D.

Imler, A. E., and Underwood, J. W.: Malignant Melanoma of the Negro. *South Surgery*, 1947 13 61

The present report on 6 cases of malignant melanoma brings the total number of cases reported in the literature to 49. However the authors believe that this condition is not reported as frequently as it is seen and they estimate its frequency as compared with the white race to be 1 in 3 or 4.

They present the second reported case of malignant melanoma in the negro arising in the nose, the third reported case occurring in the mouth and the first instance of a primary lesion of the rectum.

The relative scarcity of malignant melanoma in the negro is possibly best explained on the basis of a better physiological control of pigment formation. As malignant melanomas are found in equal frequency on the soles of the feet in the white and negro

races there is no basis to support the common belief that malignant melanomas in the negro are more likely to arise in areas of partial pigmentation.

The origin of malignant melanoma is still unsettled.

Malignant melanoma in the negro is similar, in histologic appearance to the lesions seen in white individuals and there is no apparent difference in the relative malignancy. The microscopic pictures of the primary and metastatic lesions are frequently dissimilar.

The amount of pigmentation present is no indication of the degree of malignancy although it is believed that considerable amounts of melanin mean a high degree of differentiation. This is of little importance since varying amounts of pigment may exist in the same tumor.

The role of trauma as an activating agent has been stressed by many authors. Malignant melanoma is one type of malignancy which in many cases has an indisputable relationship with trauma.

The authors review the literature on malignant melanomas in the negro and present 6 previously unreported cases. EDWARD R. DOKOCHETZ, M.D.

DUCTLESS GLANDS

Keating, F. R. Jr.: Hyperparathyroidism. *Am J Otolaryngol* 1947 33 116

Hyperparathyroidism is called primary when more parathyroid hormone is produced than the body requires, and is called secondary when an increased production of parathyroid hormone is a compensatory response to some other condition. Primary hyperparathyroidism may be caused by a hyperfunctioning tumor of one or more of the parathyroids or by hypertrophy and hyperplasia consisting entirely of "wucherhelle" cells and involving all the parathyroid glands.

At first recognized only when it had produced a severe and disabling disease of the skeleton namely severe fibrosa cystica generalisata, primary hyperparathyroidism is now known to occur without these extreme changes and to vary remarkably both in the kind and intensity of its manifestations. Cases may be classified according to the presence or absence of skeletal involvement. In about a third of the cases there is classical osteitis fibrosa cystica generalisata in a third there is minimal or atypical skeletal disease and in the remainder there is no discernible evidence of skeletal involvement. In 75 to 95 per cent of cases there is calcification of the kidneys or renal stones.

Cardinal criteria. Regardless of its manifestations primary hyperparathyroidism is always characterized by an increase of calcium and a reduction of phosphorus in blood serum and by increased urinary excretion of both calcium and phosphorus.

Symptomatology. Symptoms vary greatly from patient to patient, both in number and in severity. They may be enumerated as follows:

- (1) Symptoms directly related to the chemical changes in the blood and urine per se
 - (a) Urinary symptoms: polyuria and polydipsia.
 - (b) Gastrointestinal symptoms: anorexia, nausea, vomiting, abdominal pain.
 - (c) Neuromuscular symptoms: fatigue, lassitude or stupor, weakness, loss of muscle tone, muscular atony, constipation.
- (2) Symptoms resulting from involvement of the skeleton:
 - (a) With minimal bone disease: aches and pains, backache.
 - (b) With osteitis fibrosa cystica: bone tenderness, pathologic fractures, decreased stature, pigeon breast and other deformities, cysts and tumors particularly in the jaw, metacarpal bones, and ends of long bones.
 - (c) Symptoms resulting from secondary involvement of the urinary tract
 - (a) With nephrocalcinosis (calcification of the renal substance): renal insufficiency and uremia.
 - (b) With renal calculi: renal pain, renal colic, urinary obstruction and infection, pyelonephritis and uremia.

Roentgenographic findings. Abnormalities evident in roentgenograms vary from mild reduction of bone density in cases of minimal bone disease to a striking picture in osteitis fibrosa cystica generalisata. The latter is characterized by multilocular osteoporosis, a fibrocystic change in skeletal architecture, subperiosteal cysts, fractures, tumors, large cystic lesions, and cal cysts. The entire skeleton is affected, the skull and long bones usually more so than the spinal column.

Dental findings. In cases of intensive bone disease, the abnormal metamorphosis of bone occasionally produces malocclusion and prognathism. Epulis is fairly common. Teeth sometimes fall out because of resorption of the underlying bone, but the teeth themselves are unaffected by the demineralizing process, and dental caries is, if anything, reduced. Dental roentgenograms show loss of bone architecture and a characteristic ground glass osteoporosis with disappearance of the lamina dura.

Physiologic implications of primary hyperparathyroidism without bone disease. Regardless of the site of action of parathyroid hormone, it is axiomatic that excretion of calcium in urine and feces must exceed ingestion of calcium before calcium stores in the skeleton can become depleted. Other factors being equal, patients who have less severe degrees of hypercalcemia (that is, milder hyperparathyroidism) or pericarditis (that is, milder hyperparathyroidism) are therefore most likely to escape bone involvement, but other factors thus far unknown also may be involved. The very existence of

hyperparathyroidism without bone disease from the "renal theory" over the "bone theory" of action of parathyroid hormone, although proponents of the latter point that absence of clinical or roentgenographic evidence of involvement of bone does not entirely exclude it.

Differential diagnosis. Hyperparathyroidism must be differentiated from (1) other conditions depleting the serum calcium, such as hypervitaminosis D, acute osteoporosis, multiple myeloma, sarcoidosis, and metastatic malignant lesions; (2) other conditions affecting the skeleton, i.e., senile, postmenopausal and secondary osteoporosis, secondary hyperparathyroidism, rickets, osteomalacia, Paget's disease, osteogenesis imperfecta, and osteitis fibrosa cystica disseminata.

Practically speaking, the recognition of hyperparathyroidism depends on considering the possibility in (1) all patients who have cystic or demineralizing disease of bone; (2) all patients who have renal colic or who have renal insufficiency of undetermined origin; (3) patients who have polyuria and polydipsia; and (4) patients who have severe and unexplained gastrointestinal symptoms.

Secondary hyperparathyroidism. Severe chronic renal insufficiency is accompanied by parathyroid hyperplasia involving chief cells, and sometimes by hyperplasia or renal osteitis. The exact pathogenesis of these bone lesions is in doubt. A similar hyperplasia of the chief cells of the parathyroids also occurs in rickets due to vitamin D deficiency, osteomalacia, pregnancy, lactation, and other conditions accompanied by calcium deprivation.

Treatment of hyperparathyroidism. Medical treatment is dangerous, irradiation therapy ineffective. Surgical removal of a parathyroid tumor or subtotal resection of parathyroid hyperplasia is the only effective treatment for primary hyperparathyroidism. Secondary hyperparathyroidism per se is probably a compensatory phenomenon and should not be suppressed.

Gherlinzoni G: Parathyroidectomy and Recklinghausen's Disease (Parathyroidectomia morbo de Recklinghausen). *Chir org maxillo-fac*, 1945, 30:125

Two clinical cases of fibrocystic osteitis, with bone swellings, deformities, and a history of repeated fractures incident to slight trauma, were operated upon and a search was made for parathyroid hyperplasia or adenoma. In one case that of a 58 year old white male the extremities were of excessive length and in both cases the roentgenologic examination disclosed in addition to the cystic areas, a marked calcification of the long bones. The laboratory report disclosed the presence of excessive amounts in the urine and the excretion of excessive large amounts in the urine for both cases. In the second case, that of a boy of 12 years, there were no signs of the onset of puberty. At operation no adenoma was found in either case, however normal parathyroid glands and thymus which appeared to represent normal parathyroid glands were removed from the left side.

the man after exposure of the left border of the thyroid gland. From the boy both right and left inferior parathyroids were removed.

Following the operation in the man the histologic examination showed that the tissues removed were not parathyroid, although there was a noticeable fall in the blood calcium and phosphorus. Roentgenologic examination showed that the distribution of calcium in the bones remained about the same, and 2 years later the patient suffered a fracture of the lower third of the left tibia. Five years later the patient was still below that preceding the operation, the patient was generally well and able to work, and x rays showed improved bone calcification, especially in the region of the cystic involvement of the left tibia. In the boy the calcemia decreased and remained decreased for a period of nearly 2 years of observation.

A number of osteotomies were done for correction of the deformities present and the histologic examination of the wedges of bone tissue removed at these times (all at least a month following the operation) showed evidence of much formation of osteoid tissue and intense activity of the osteoblasts.

From these experiences and a study of the literature the author concludes that there is a possibility that Recklinghausen's disease may occur in the absence of parathyroid adenoma or hypertrophy that spontaneous remissions may occur but that the simple exploratory operation without removal of even normal parathyroid tissue is inefficient and that at least some normal parathyroid should be removed in this contingency. Corrective osteotomies may be undertaken shortly after these parathyroidectomies and consolidation of the resultant dehiscences will take place in normal periods of time. The author does not wish to cast any doubt on the relationship of Recklinghausen's disease to parathyroid adenoma nor to deprecate the necessity of surgical exploration of the thyroid region in these patients.

JOHN W. BENDIS, M.D.

SURGICAL PATHOLOGY AND DIAGNOSIS

Deming, C. L., Hovenman, M. S., and Greene, H. S. N: Heterologous Transplantation of Carcinoma of the Urethra. *J Urol* Balt, 1947 57 319

The selective ability of cancer to survive and to grow upon heterologous transfer offers a ready means of differentiation from other growths possessing a morphological or clinical resemblance.

The authors describe the results obtained in 2 cases of heterologous transplantation of carcinoma of the human male urethra. Both male and female guinea pigs were used as alien hosts, and heterologous transfer was successfully carried out.

In the first case the cancer originated in the posterior portion of the anterior urethra, and the section used for transfer was derived from its metastatic inguinal lymph node. Ten animals were inoculated 6 male and 4 female, and a single "take" resulted

This animal, a male was sacrificed on the eighty first day following inoculation at which time the anterior chamber of the eye was two-thirds filled by tumor.

In the second case, the cancer originated in the anterior portion of the anterior urethra, and a section of the cancer from that area was transplanted. Four animals all male guinea pigs, were selected as alien hosts, and again a single "take" resulted. The animal with the successful take was sacrificed after 43 days at which time the anterior chamber was one-half filled by tumor.

Morphologically the transplants resembled the original tumor in every respect. In the case of the adenocarcinoma, both epidermoid and adenoid architecture were present in the transplant. In the second case, the epidermoid structure of the transplant reflected that found in the original tumor.

Cancers of the urethra, like other malignant growths in man, are transplantable heterologously. The subsequent history of the 2 cases in question bears out the previous suggestion that only those tumors capable of heterologous transfer are true cancers. The growth of transplant in alien hosts reflects the morphological character of the growth in the original human host.

HARRY W. FINKE, M.D.

Snyder H. E., and Culbertson J. W.: Causes of Death in Battle Casualties Reaching Hospitals. *Am J Surg*, 1947 73 184.

The authors present a statistical report on 1,450 American battle casualties occurring in the Fifth Army Hospitals, in Italy from January 1, 1944 to May 3, 1945. The number of men dying on the battlefield or on the way to a hospital was found to be

TABLE I.—DISTRIBUTION OF DEATHS STUDIED BY PRINCIPAL WOUND GROUPS

	Number of cases	Percentage of deaths studied
Intra-abdominal	408	28.1
Intracranial	907	62.5
Thoraco-abdominal	118	8.3
Intrathoracic	4	0.3
Lower extremity with bone involvement	4	0.3
Unclassified, multiple wounds	30	2.1
Combined intra-abdominal & intrathoracic	31	2.1
Lower extremity soft tissue only	17	1.2
Intracranial (I. intravertebral)	5	0.3
Cervical		
Upper extremity with bone involvement	3	0.2
Maxillofacial, with bone involvement	4	0.3
Upper extremity soft tissue only	3	0.2
Abdominal wall	20	1.4
Total		100

TABLE II.—DATA RELATIVE TO HOSPITAL AD-MISSION ANESTHESIA SURGERY AND ETIOLOGY IN THE 523 CASES* IN WHICH THE IMMEDIATE CAUSE OF DEATH WAS SHOCK

	Died on Arrival	Dying on admission	Died before anesthesia	Died during anesthesia induction	Died during primary surgery	Died Subsequent to primary surgery	Total
Etiology of shock Trauma and hemorrhage	5	25	7		10	52	84
Contamination or sepsis plus trauma and hemorrhage			26	3		62	60
Cardiorespiratory embarrassment plus trauma and hemorrhage plus contamination or sepsis			10			48	7
Cardiorespiratory embarrassment plus trauma and hemorrhage	8	7	44	3	1	60	117
Total	13	32	127	6	11	222	471

*34 % of 30 American battle casualty deaths reported by Fifth Army Hospital January 1, 1944 to May 1, 1945
†Excludes dead on arrival and dying on admission

about ten times as great as that of men who died after reaching the hospital. The cases were studied from the standpoint of principal wound groups (Table I) and the immediate cause of death. Among the cases reviewed, 733 gross autopsy reports were available for study

Shock was named as the immediate cause of death in 523 of the 1,450 cases. In addition to these cases there were 750 other cases in which shock was a contributory or associated condition. In only 17 of the 1,450 deaths was there no evidence of shock. Loss of whole blood was the most important factor in the vast majority of battle casualties in shock (Table II). Neural trauma and/or intracranial hemorrhage or clot was second on the list, and the immediate cause of death in 213 cases. Third on the list of causes of death was nephropathy. This category includes all those cases in which death was known to be due to a lower nephron nephrosis or pigment nephropathy. Included in this group are a few cases in which mismatched blood transfusion produced the lesion also included are a few cases which sulfonamides were rather definitely the etiological agent. In the vast majority of cases, however, none of these factors could be definitely named as the cause of the nephropathy. It is believed that some other factor or factors, dependent upon a severe degree of shock over a long period of time was responsible for most of the cases. Peritonitis was fourth on the list of causes of death. Clostridial myositis was fifth on the list. A reduction in mortality in cases of this disease was noted primarily by cause of more complete surgery on all wounds, the more liberal use of blood, and the advent of intravenous use of penicillin. Pneumonia, fat embolism, thrombotic embolism, and other factors were listed as causes of death. Twenty-seven patients died of fat embolism. This diagnosis was not recorded except when microscopic reports indicated large amounts of fat in the pulmonary sections, and the record indicated a clinical behavior justifying the diagnosis.

JOHN E. K. SMITH, M.D.

SURGERY GYNECOLOGY AND OBSTETRICS

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INTRACRANIAL MENINGIOMAS SURGICAL RESULTS

FRANCIS C GRANT MD F.A.C.S., Philadelphia, Pennsylvania

BETWEEN January 1, 1936 and January 1, 1947 one thousand and one brain tumors were verified in the Neurosurgical Clinics of the University and Postgraduate Hospitals of the University of Pennsylvania. Of these 149 or 14.5 per cent were meningiomas. Our interest in this group. Although a review of this series of meningiomas at this time can show little of importance with regard to the ultimate life expectancy in many cases nevertheless certain other facts of interest will appear. Furthermore this is not the record of a single operator. The majority of these patients were operated upon by the author but his associates, assistants and residents also contributed. Hence this series represents what can be done in a neurosurgical clinic every member of which is expected eventually to be sufficient to expert to remove a brain tumor.

From the Neurosurgical Services of the University and Postgraduate Hospitals of the University of Pennsylvania School of Medicine.

Fig. 1. AR female aged 45 years. Meningioma of left inferior parietal area, right 1.5 gram. Operation was performed December 2, 1945. Removal was complete. Patient turned to previous occupation. In January 1946 she was examined August 15, 1946 and January 15, 1947. Apparently she made a complete recovery.

Fig. 2. III male aged 43 years. Meningioma of left parietal area, right 1.5 gram. Operation was performed December 2, 1945. Removal was complete. Patient turned to previous occupation. In January 1946 she was examined August 15, 1946 and January 15, 1947. Apparently she made a complete recovery.

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Fig. 4. SM male aged 31 years. Meningioma of right frontal area, right 1.5 gram. Operation was performed January 15, 1946. Removal was complete. Patient turned to previous occupation. In January 1947 he was examined August 15, 1947 and January 15, 1948. Apparently he made a complete recovery.

SURGICAL ASPECTS

Intracranial surgery has seen much technical improvement in the past 25 years. The development of ventriculography by Dandy made correct localization of the position of the tumor possible in over 90 per cent of cases. Electrosurgical methods as introduced by Cushing (1) vastly improved hemostasis of particular importance in attacking a tumor of the type under present consideration. From Cushing's clinic came the first description of the importance of suction in intracranial procedures (4) although Frazer had already used it for 2 years in operations on the trigeminal root. As the technique for intravenous transfusions was improved the neurosurgeon rapidly appreciated its value using at first saline alone then adding blood if necessary and finally in this clinic at least and certainly in many more routine whole blood transfusion in any intracranial procedure. Neurosurgeons have learned by hard experience how to handle increased intracranial pressure and all that it

performed October 22, 1940. He reported December 13, 1941. He has had six right Jacksonian convulsions beginning in leg. He vacillates judgment for starts a job but never finishes it. He has very slight right hemiparesis and spasticity. He is put on phenobarbital. On January 15, 1942 his condition was unchanged. He has had no more seizures.

Fig. 4. SM male aged 31 years. Meningioma of right frontal area, right 1.5 gram. Operation was completed January 15, 1946. He returned to work April 1, 1946. He reported continued improvement. He was put on phenobarbital and convulsions ceased by early April. The cranial defect was repaired by cranioplasty April 15, 1946. He reported October 15, 1946. Neurological examination was negative. The convulsions did not recur. He was unemployed.



Fig. 1



Fig. 2

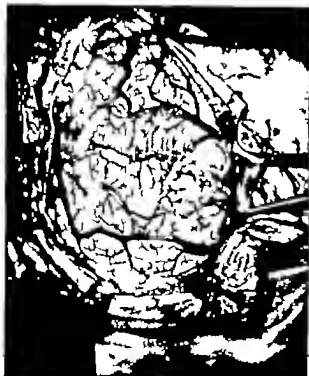


Fig. 3



Fig. 4

Intracranial Meningiomas Surgical Results — Francis C. Grant

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1. on the Neurosurgical Services of the University and Postgraduate Hospitals of the University of Pennsylvania School of Medicine

1. A female aged 45 years. Meningioma of left frontal area. Weight 185 grams. Operation was performed December 2, 1935. Removal was complete. Patient returned to previous occupation February 15, 1936. She was examined August 15, 1940 and March 15, 1942. Slightly but she has made a complete recovery. 2. A male aged 45 years. Meningioma of left frontal area. Weight 142 grams. Operation was performed November 6, 1941. The tumor was removed by removal of the dura and removal of the tumor. On June 1, 1944, patient was reported as being well. 3. A male aged 41 years. Meningioma of left frontal area. Weight 142 grams. Operation was performed November 6, 1941. The tumor was removed by removal of the dura and removal of the tumor. On June 1, 1944, patient was reported as being well. 4. A male aged 41 years. Meningioma of left frontal area. Weight 142 grams. Operation was performed November 6, 1941. The tumor was removed by removal of the dura and removal of the tumor. On June 1, 1944, patient was reported as being well.

performed October 22, 1940. He rejected December 13, 1944. He has had six right Jacksonian convulsions beginning in leg. He vacillates judgment poor. Starts a job but never finishes it. He has very slight right hemiparesis and is unable to work. On January 15, 1946, his condition was unchanged. He has had two more attacks of epilepsy. 5. A male aged 35 years. Meningioma of right frontal area. Weight 185 grams. Removal was complete. Operation was performed January 15, 1941. He returned to work April 1, 1941. He rejected January 15, 1941. He has had generalized convulsions every 2 to 3 weeks. He was put on phenobarbital. Convulsions continued every 2 to 3 weeks. The cranial defect was closed by cranioplasty April 5, 1944. He rejected October 15, 1944. Neurological examination was normal. The patient was unemployed.

implies before during and after operation. Ventricular tap will produce relief from intra cranial tension just prior to operation thus materially reducing bleeding from the skin flap. Any tendency of the brain to herniate after the dura is opened is diminished and the ease of tumor exposure and removal thereby increased. Wiring the bone flap silk sutures, possibly deep and always superficial rubber tissue drains in all craniotomy wounds keep the flaps flat and safe. But in this clinic tap of the lateral ventricle after intracranial surgery is the chief reliance in reducing post operative tension within the skull. A patient suspected of having an intracranial mass lesion is very rarely operated upon without air studies preferably of course a ventriculogram. Parieto-occipital burr holes for ventricular tap usually bilateral are inserted in every instance. Through these perforations ventricular tap can be done for relief of pressure preoperatively or postoperatively and ventricular estimation or ventriculography carried out. The fact that only three tumors in this series were not surgically exposed at the first operative procedure is fair evidence of the value of such studies.

Proper supportive measures during the operative period are essential. Intravenous saline has been used routinely in this clinic since 1925. Now every patient is given at least 500 cubic centimeters of blood. This transfusion is completed just before the bone flap is replaced so that any consequent rise in blood pressure will produce oozing which the operator can check before the wound is closed. But one postoperative clot requiring re-elevation of the bone flap occurred in this series fortunately with recovery. In another case a clot was found at autopsy and considered to be of sufficient size to have been a factor in the fatality. Since autopsy was performed on every case in which a fatality resulted this record can be substantiated. In but 6 cases was a two stage operation considered necessary: a bilateral frontal 350 gram meningioma in a 14 year old boy and another a 250 gram meningioma of the left occipital pole in a 31 year old woman. It is our practice to turn down rather larger flaps than is customary in other clinics (see Fig 6 d). This fact plus the

routine use of preoperative air studies, has made prompt and complete exposure of the tumor possible. In 8 cases bilateral frontal flaps were fashioned where an olfactory groove meningioma was suspected preoperatively to involve both sides of the falx.

VITAL STATISTICS

Of these 149 patients 92 were females 57 males. Four of the males and 2 of the females were negroes. The youngest patient was 7 years the oldest 76. The average age at operation was 43 plus years for the women, 43 minus years for the men. The average duration of symptoms prior to operation averaged 2½ years. If 6 patients with preliminary seizures existing for over 8 years prior to operation are excluded the preoperative period at which clinical evidence of intracranial involvement appears is just a fraction over 2 years. Injury appears to have been a factor in 14 cases, all vault tumors.

POSITION OF THE TUMOR

In his recent monograph Cushing (2) has gone into great detail in describing the exact position and point of origin of each tumor in his series. We have attempted a similar accuracy in describing the position and point of origin except in those tumors arising from the sphenoid ridge. The exact point of attachment of a tumor to the ridge or whether it arose from the pterion has been difficult to determine in most instances, even after careful examination of the preoperative x-ray films and a painstaking perusal of the always detailed operative notes. This group has simply been listed therefore as sphenoid ridge tumors. Possibly some of the meningiomas described in this series as olfactory groove tumors may have originated from the inner end of the sphenoid ridge. In operating upon meningiomas in this locality especially when the tumors are bilateral the author has always been too harassed by the technical difficulties to be very certain in every case of the exact origin of the tumor. Figure 5 gives the various locations of the tumors with the surgical results. As was to be expected the more closely the tumor lay to the carotid vessels, olfactory groove, suprasellar area, sphenoid ridge, and

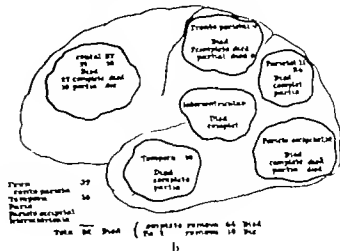
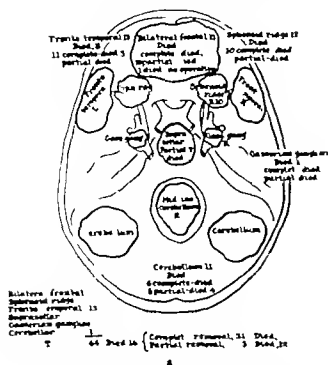


Fig. 5. Various locations of tumors with surgical results
a Tumors of base b tumors of vault

to the base of the skull gasserian ganglion and posterior fossa the higher the mortality and the less the chance of a complete removal. The surgical difficulties here are mechanical and inherent in the position of the tumor. In a second group of cases the tumor lies in the convexity of the brain and is relatively easy of access. Success or failure depends on the operator's judgment his opinion as to the patient's condition as a good or bad risk, and how much surgery is advisable.

In the first group were 64 cases with 16 deaths, a case mortality of 25 per cent in the second 82 cases with 9 deaths a case mortality of 10 per cent. In the cerebellar group of 11 cases 7 were removed 4 completely and 3

incompletely with recovery. I our died : be cause the tumor lay in the vermis of the cere bellum and was never exposed (see Fig 7 b) one, due to pontine softening following re moval of the tumor one from pneumonia in a patient who stopped breathing preoperatively and was revived by an emergency ventricular tap and the last in an elderly man shown by neurologic study to have a large tumor in volving all his cranial nerves from the fifth to the twelfth on the right. Radiologic studies showed a large defect in the bone. A chordoma was suspected but since he had intense tri geminal pain a medullary tractotomy seemed indicated. This was performed and the tumor simply verified without attempt at removal.

TABLE I — POSITION OF TUMOR IN 34 CASES WITHOUT POSTOPERATIVE SEQUELAE

Bilateral frontal	13	N PO symptoms	3 partial removal 2 4 yrs.
Sphenoid ridge	7		3 complete removal 1 2 yrs.
			2 complete removal 2 2 yrs.
Frontal left and right	37		13 complete removal 10 10 10, 10, 10 yrs.
			7 6 5 4 yrs.
			3 3 3 yrs.
			2 yrs.
Temporal	23		3 complete removal 10, 6, 5 yrs.
Parietal	33		6 complete removal 7 7 7 yrs.
			6, 5, 3 yrs.
Cerebellar	11		3 complete removal 7 7 6 yrs.
Supratentorial	7		1 incomplete removal 7 yrs.
Caudate ganglion	3		2 complete removal 2 2 yrs.
Interventricular	3		1 complete removal 5 yrs.
	146 cases	Total	14 cases

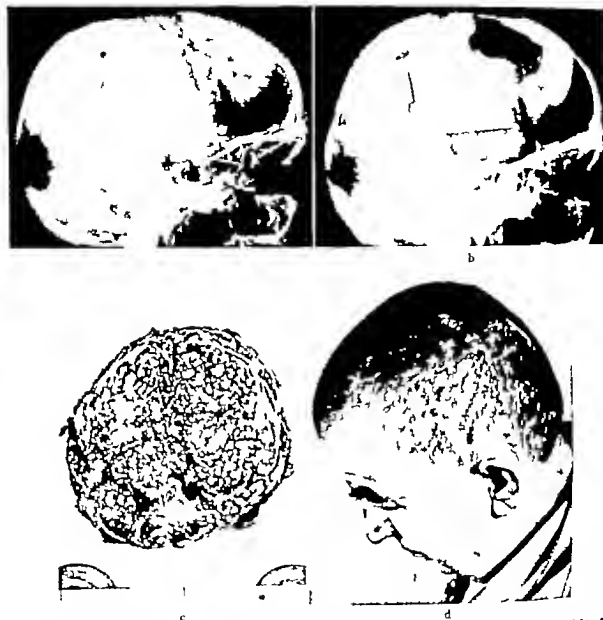


Fig 6. Meningioma-characteristic vascular groove changes. (a) bone operative specimen, and operative scar. (b) Enlarged vascular markings in skull over meningioma. (c) Tumor removed. (d) Patient to show left frontoparietal flap and burr hole for ventricular tap.

Atelectasis of the right lower lobe developed with death from pneumonia in 6 days. Both of the deaths in the group of suprasellar tumors were accompanied by hyperthermia. Autopsy in each case showed only partial removal of a tumor which extended backward to involve the third ventricle. In the group of 13 bilateral frontal or olfactory groove meningiomas, the cause of 1 death was inanition

and chloride deficiency on the forty second day following the removal of a 375 gram tumor in two stages, from a 14 year old boy. The second death occurred from presumed operative shock within 24 hours, following partial removal of an olfactory groove tumor from a 54 year old woman who was a good preoperative risk. The third death in a 47 year old woman in excellent physical condition was

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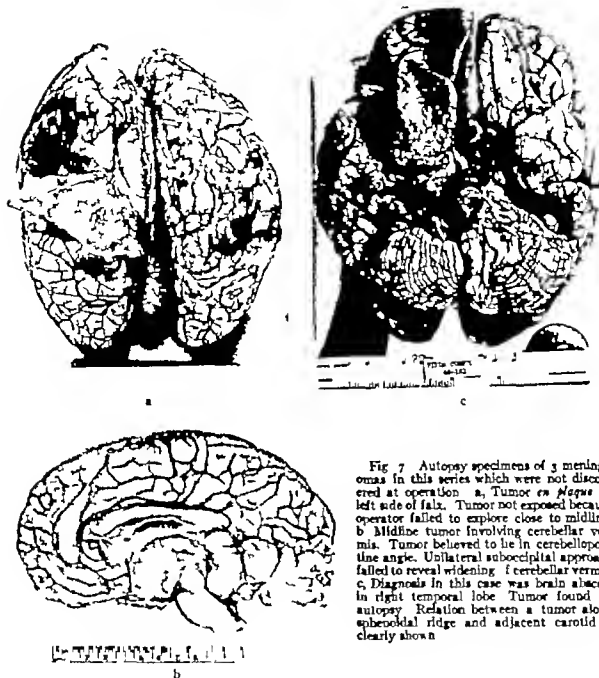


Fig. 7 Autopsy specimens of 3 meningiomas in this series which were not discovered at operation. a, Tumor *en plaque* on left side of falx. Tumor not exposed because operator failed to explore close to midline. b, Midline tumor involving cerebellar vermis. Tumor believed to lie in cerebellopontine angle. Unilateral suboccipital approach failed to reveal widening of cerebellar vermis. c, Diagnosis in this case was brain abscess in right temporal lobe. Tumor found at autopsy. Relation between a tumor along sphenoidal ridge and adjacent carotid is clearly shown.

due to rupture and prompt control by clipping of the right internal carotid artery. The attack on this tumor was conducted in two stages, blood loss was never a serious factor but she developed a complete left hemiparesis never recovered consciousness and died in 48 hours. Autopsy showed no postoperative hemorrhage and no pulmonary or cardiac involvement. On 5 other occasions, in tumors unconnected with this series a clip has of necessity been applied to the right internal carotid during an operative session. Three of these patients re-

covered although the left hemiparesis and hemianopsia were unfortunately complete and permanent.

Among the 5 deaths in the frontotemporal group the first occurred in a 53 year old woman 14 days following partial removal of a tumor in the left sylvian fissure and the second from surgical shock 2 hours after removal of a 168 gram meningioma from the right sylvian area in a 52 year old woman who was an unfavorable risk. This death was due to bad surgical judgment as a one stage rather than

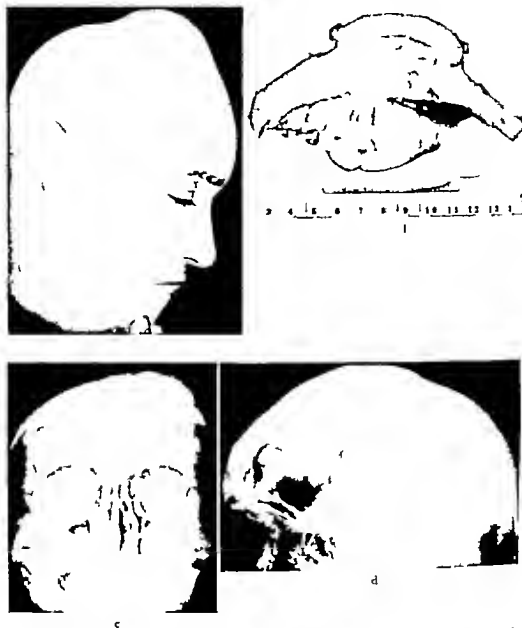


FIG 8. T illustrate typical findings in meningioma. a, Patient with frontal exostosis of skull. b, Transaction of specimen removed to illustrate involvement of bone, dura, and brain by meningioma. c and d, Frontal and lateral cephalogram to show characteristic bone changes.

a two stage procedure was used. The third death occurred 6 days postoperatively from meningitis, the only case in this series from this cause. The fourth fatality took place in a 47 year old woman with uncinate fits. Fifty five grams of a meningioma, lying in the floor of the right middle fossa, were scalloped out with the bovie. Autopsy 5 days later showed

60 grams more of tumor remaining and extending down through the incisura into the right cerebellopontine angle. The fifth mortality resulted from pneumonia 5 days after the removal of an 80 gram tumor from the left middle meningeal area of a 60 year old male. He was a poor risk sent in from a neighboring asylum where because of his aphasia and



Fig 9. Typical ventriculogram. Meningioma close to falx, left cerebral hemisphere. Figure 3, frontisplane, shows this particular tumor exposed. a, Anteroposterior; b, lateral.

mental dullness a diagnosis of senile arteriosclerosis had been reached. No great technical difficulty or hemorrhage attended the removal of this tumor. The patient was semi-conscious with stertorous breathing when first seen and was considered an emergency. But he was a recent case plenty of blood was available surgical shock was never a factor and he should not have died.

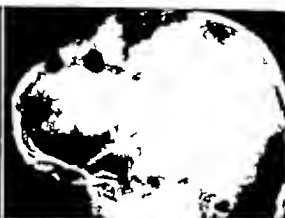
The single mortality in the three gasserian ganglion tumors occurred in a patient who was operated upon as a suspected case of trigeminal neuralgia involving the second and third divisions on the left. The tumor was found and partially removed. She died of meningitis on the third day. Autopsy revealed an unsuspected right frontal abscess leaking into the ventricle.

The second group of tumors in this series is made up of those tumors lying over the convexities of the brain away from the base. There are 82 cases in this series with 9 deaths roughly a 10 per cent case mortality.

The first of these was a tumor lying in the posterior frontal area attached broadly to the falx. The patient was a good operative risk. He had a convulsion on the table and one immediately after operation. He died in 72 hours

from respiratory difficulty. Autopsy showed that he had a myxolipoma of the epiglottis which seemed sufficiently large to have been the cause for his respiratory embarrassment. Furthermore he had aplasia of his right kidney. The operative wound was clean and the tumor had been completely removed.

In the second case a 47 year old woman definitely a bad surgical risk died 10 days after a second stage removal of a 150 gram meningioma from the left frontal area. This tumor was attached to the dura over the convexity only and not to the falx. Autopsy showed a bilateral bronchopneumonia with enough old clot in the operative site to raise a definite suspicion that postoperative hemostasis had not been adequate. In the third case a 40 gram meningioma lying fully *en plaque* against the falx in the median fissure was completely overlooked following exposure of this area (see Fig 7 a). The patient died in 24 hours from increased pressure and autopsy revealed the tumor. This is 1 of the 3 cases in this series in which the tumor was not found at operation. The fourth fatality occurred in a 52 year old woman from whom 170 grams of meningioma had been removed from the right temporal area. This tumor was attached to



b

Fig 1. a. Roentgenogram to show bony thickening by tumor in this area. b. Face view of patient with orbital exophthalmos caused by meningioma involving sphenoid ridge and orbital plate. c. Postoperative film to show apparently complete operative removal of tumor.

recovery, but died suddenly 2 weeks later from abrupt cardiac failure.

One of the 2 cases in the parietal group was a 39 year old woman who was a good operative risk. A 200 gram meningioma was found in the parietal area attached to the dura only. An attempt to remove this lesion at one stage resulted in an immediate death on the table from operative shock. The second death occurred in a 62 year old woman with an exostosis of the left frontoparietal area. The exostosis plus a small meningioma *en plaque* was readily removed (see Fig 8 a, b, c, d). The patient made a good postoperative recovery, but died suddenly 17 days after operation as she was dressing to go home. Autopsy showed a pulmonary embolism. The wound was clean.

Two fatalities followed removal of a meningioma in the occipital area. The first of these was a 56 year old woman with a heart murmur and a uterine myoma. An 80 gram meningioma was successfully removed from the right occipital region. She died on the seventh day from bilateral bronchopneumonia and cardiac failure. Autopsy showed that the wound was entirely clean. The second death was in a 29 year old woman 6 months pregnant and a fair operative risk. An 80 gram meningioma was removed from the body and posterior horn of the left lateral ventricle. At the end of 48 hours the patient seemed to be in

the dura alone and not to the falx. The patient was not a good operative risk and the operator used poor judgment in attempting to remove the tumor at a single sitting. The patient died 2½ hours later obviously from surgical shock. The last of these frontal fatalities occurred in a 67 year old woman who was obese, hypertensive and had evidence of cardiovascular disease. A 32 gram meningioma attached to the dura was easily removed. The patient made a good immediate postoperative

good condition but died suddenly about 60 hours after operation apparently from abrupt cardiac failure. Autopsy showed the wound clean and the tumor completely removed.

In addition to these 25 operative deaths, there were 3 other cases verified as meningioma in which no operation was performed. In one case, a 55 year old woman blind deaf and aphasic, was refused operative intervention. Autopsy showed 175 grams of tumor springing from the left sphenoid ridge and filling up the left sylvian fissure. The second case was a 64 year old woman totally blind and anomic for 3 years with evidence of marked sellar erosion and x ray evidence of have an inoperable lesion. Autopsy showed a large bilateral factory groove meningioma. The third case was a 42 year old woman who was admitted because of pain in and behind her right ear and a story of a chronic draining ear for 30 years. She was mentally dull with a right sided head ache. Lumbar puncture showed 9100 white blood cells in the spinal fluid. X ray studies showed a sclerosing and destructive process in the right mastoid together with questionable erosion of the right sphenoid ridge. Tap was made for a right temporal lobe abscess without success and a mastoidectomy revealed chronic mastoiditis. She died from increased pressure about 48 hours after mastoidectomy. Autopsy revealed a large meningioma involving the right sphenoid ridge and weighing roughly 160 grams. The right anterior and middle cerebral arteries were involved (Fig 7 c).

PATHOLOGY

Our studies on the subgrouping of these cases are incomplete. The publication of Cushing's superb monograph on the meningiomas opened up many new pathologic vistas involving this particular group of neoplasms. But although his classification has been applied in the microscopic study of these tumors since 1941 time has not permitted a complete review of the 1936-1940 cases. This review has been undertaken and will be presented in the near future. Suffice it to say here that the pathologic diagnosis of each of these cases has been made and is simply meningioma, without any attempt to classify them further.

DIAGNOSIS

In 33 of these 149 verified meningiomas, localization of the lesion was impossible on the basis of careful and painstaking neurologic studies and routine x ray examinations. It must be admitted that 11 of these patients were stuporous or unco-operative so that detailed neurologic examinations including particularly visual fields could not be made. In every case proper localization was made by ventriculography (see Fig 9 a and b). The tumor was exposed and completely or partially removed in 32 of these 33 cases. The only case in which the tumor was not exposed was in that instance where it lay in the cerebellar vermis in the posterior fossa. In a second case already mentioned the patient was suspected of having a right temporal lobe abscess, the presence of a right sphenoid ridge meningioma being revealed only at autopsy. No air studies were carried out in this case.

In the remaining 115 cases, the location of the lesion was obvious either from detailed neurologic examination including of course careful study of the visual fields, or from the flat x ray plate. Inasmuch as these tumors are known to originate from the envelopes of the brain and consequently affect its surface it is of interest that of the 70 tumors, frontal temporal and parietal which from their position might affect either the motor or sensory cortices and produce either motor or sensory focal convulsions in but 21 of these 70 cases were focal convulsions recorded. Fifty nine of these 70 cases, however showed a contralateral motor loss or pathologic reflexes indicating pyramidal tract involvement.

With regard to the other means of diagnosis and localization flat x ray films were entirely negative in 48 cases. In 81 cases flat x ray films strongly suggested the position of the lesion and in 38 of these not only was the position of the lesion correctly estimated but a positive diagnosis of meningioma was reached. In 10 instances the x ray reports (see Fig 6 a, Fig 8 d and c, Fig 10, a) were entirely misleading as to the position of the tumor. In 20 cases the presence of a mass lesion was definite on the basis of the pineal shift. In the 48 cases in which an initial study of the flat plate was reported as negative, restudy of the plate af

ter the position of the tumor was known showed suggestively positive findings in 14 Ventriculograms (see Fig 9 a and b) were performed in 61 cases with 2 missed diagnoses both because of insufficient air. In one of these instances, exploration on the basis of reasonably positive neurologic signs revealed a tumor. In the second case a repetition of the ventricular studies proved to be positive. A ventricular estimation was performed in 31 instances and in each case proved confirmatory of the position of the tumor already fairly well established by other means.

In 20 instances an encephalogram was carried out localizing the tumor accurately in 16 cases, with 4 failures. In these 4 cases, ventriculographic studies cleared up the situation.

Electroencephalography has not been used extensively in this clinic. In this series of cases, 13 electroencephalographic studies were made, with 11 positive and 2 incorrect diagnoses.

In 3 instances an arteriogram was used once under the suspicion that we were dealing with an aneurysm, and this lesion was ruled out by the arteriogram. In the second case the arteriogram was performed on the wrong side with negative results, and in the third case it was positive for the presence of a tumor.

The weight of these tumors may be of interest because it gives some clue as to their size (see Fig 6 c). Two of these tumors weighed over 300 grams, 4 over 200 grams, 14 over 150 grams, 15 over 100 grams, 26 over 50 grams, and 14 25 to 50 grams. The average weight of the 75 tumors in which it was recorded was 108 grams.

SURGICAL CONSIDERATIONS

In meningiomas owing to the very slow growth of the tumor the patient's physical condition is usually better than when the brain has been invaded by the more rapidly expanding gliomas. Inattention from continuous vomiting is less commonly seen. Consequently the impression has been formed that the meningiomas are better risks preoperatively. However in the past 5 years it has been customary to observe carefully the serum protein level in these patients. If the level is low preoperatively or postoperatively immediate efforts

are made by prompt use of amogen or blood to restore it to normal (5). Whole blood is used routinely at present in what, 10 years ago, would have been considered enormous amounts to maintain hemoglobin and blood pressure levels. In 27 of the last 93 operative sessions, the patients received 1000 cubic centimeters, or more, of whole blood, plus at least 500 cubic centimeters of normal saline, and in 7, 1500 to 2000 cubic centimeters were administered during or within 12 hours after the craniotomy. The recent suggestion (6) of prebleeding and subsequent autotransfusion has not been attempted. All our tumor cases are given 1500 to 3000 cubic centimeters of intravenous fluid in the first 24 hours postoperatively. I am not entirely convinced that all the blood given is essential. But, with the establishment of a bank in the hospital, blood is always available and these patients, unquestionably, are in better condition at the end of 48 hours postoperatively than they were 5 or 10 years ago, when less blood was used. Shock from exsanguination following removal of a meningioma is no longer seen.

All cranial tumor surgery in this clinic is carried out with patient in the horizontal position. The erect, or sitting position is used only in trigeminal root sections. Local anesthesia, plus morphine is the anesthesia of choice in craniotomy for a supratentorial tumor. An adult who is not stuporous preoperatively receives $\frac{1}{4}$ grain of morphine an hour before coming to the theater. Restlessness during operation is controlled by $\frac{1}{4}$ grain of morphine or by small amounts of sodium pentothal injected into the intravenous tube. In all suboccipital craniectomies, with patient in the prone position endotracheal ether is used. The importance of the free air way afforded by the endotracheal tube cannot be overemphasized. Venous congestion with consequent increase in intracranial pressure which even a tap of the ventricle will not relieve, is avoided. I know of no more dreadful situation that the neurosurgeon can face than to have the posterior fossa open, have something go wrong with the anesthesia, with consequent coughing and straining by the patient which may in a short 30 seconds so congest his cerebellar hemispheres that they bulge out of the wound. Any further attempt

at tumor extirpation is impossible and unless something can be done by deepening the anesthesia or repositioning the patient's head the operator may at times have trouble in closing the muscles. All this has been avoided in our experience, by skillfully administered endotracheal ether. That following the introduction of an endotracheal tube the patient has an increase in his laryngeal secretion, from irritation of the tube seems certain. And an increase of laryngeal secretion may lead to asphyxiation pneumonia, especially since damage to the vagus and glossopharyngeal nerves with vocal cord paralysis and loss of cough reflex not infrequently accompany removal of a meningioma from the posterior fossa. But the advantages of a clear air way and consequent absence of pressure during tumor extirpation far outweigh this disadvantage.

Careful hemostasis during the approach to a meningioma is of course essential. Scalp, pericranium, bone and dura, all may be highly vascular. Preoperative ventricular tap for relief of pressure will help reduce bleeding. Electrically driven drills and saws save time in turning down flaps. Speed in elevating the bone flap separating it from the tumor if the lesion has penetrated the dura, or exposing the dura and promptly coagulating its many bleeding points, saves unnecessary loss of blood. Motor driven tools have halved the time required to turn down a flap. Once the tumor is exposed and its dural attachment cut off from adjacent vessels and thoroughly coagulated the most severe, early hemorrhage is controlled. In tumors attached to the dura overlying the convexity of the brain the problem is relatively simple. Is the patient's condition sufficiently satisfactory to withstand the removal of a tumor presumably of some size? Once the cortical vascular connections to the tumor have been secured a simple matter with electrocoagulation but little bleeding usually occurs from deeper vessels. In 5 of our patients disaster followed what seemed to be the relatively bloodless removal of a convexity tumor. In every instance the tumor was large weighing between 150 and 200 grams. Cortical resection was necessary in each case to obtain sufficient room to deliver the tumor. In 3 cases the blood pressure dropped out

suddenly about 30 minutes after the tumor had been removed, after hemostasis was apparently complete and the wound ready for closure. In the other 2 cases shock appeared an hour after return to the ward. In all these instances, no amount of intravenous fluid or pressor substances were of any avail. In no case did autopsy show hemorrhage of any amount into the tumor bed. These tumors were all of sufficient size to have compressed the midbrain. Possibly a too sudden removal of the tumor with too abrupt release of midbrain pressure caused failure of sympathetic control.

When a meningioma lies along the midline the ease or difficulty of its removal depends upon the extent of its attachment to the falx whether or not the longitudinal sinus is invaded and the rolandic vein compromised. If the dura between the longitudinal sinus and the tumor can be transected much of the blood supply to the tumor is cut off. In these tumors attached to the sinus, the better method of attack is to deliver them from the brain laterally and swing them medially across the sinus. Then the extent of sinus involvement can be seen from the undersurface of the dura, and a better chance is had to shave the dura off close to the sinus without entering it. In complete removal of a tumor in this position is often unavoidable particularly if the sinus is involved behind the entrance of the rolandic vein. Injury to the sinus in this region unless it has been invaded and obstructed by the tumor will lead to disastrous neurologic sequelae. Coagulation of any tumor remnants lying against the falx close to the sinus is, of course indicated. If the sinus has been invaded and obstructed by tumor its excision plus the adjacent dural attachment of the tumor should be carried out. Recently in a large bilateral frontal tumor in this series the anterior 15 centimeters of falx with both superior and inferior longitudinal sinuses were removed with the tumor. Fortunately no motor symptoms developed since the venous return had already been obstructed.

In the removal of sphenoid ridge or olfactory groove meningiomas, the hazard is damage to the carotid artery or its branches. In right handed persons, amputation of the right

frontal lobe is always justified if thereby a better exposure can be obtained. The carotid vessels are always behind and below the tumor. The right anterior cerebral can usually be clipped without causing neurologic sequelae. Complete removal, with dural attachment of a large meningioma in this subfrontal area requires skill, courage and a certain amount of luck. A very close calculation must be made. Should the inner third of the tumor be completely removed when enough has already been extirpated to produce great relief of symptoms while further attempt may tear the carotid, with hemiparesis certain to follow its ligation?

The results of surgical attack upon a meningioma in the posterior fossa depend upon the relationship of the tumor to the vagus nerve and brain stem. Many of these tumors spring from the arachnoid fibroblasts in the porus acusticus internus and are no more difficult or dangerous to remove than an angle tumor. The vagus lies loosely along the lower pole of the tumor and can be readily separated from it. A second group arises from the edge of the posterior lacerated foramen and involve the vagus directly. Removal of such a tumor is impossible without total injury to the vagus and glossopharyngeal. If these nerves are injured with ipsilateral vocal cord paralysis and loss of the gag reflex great care is necessary to prevent aspiration pneumonia postoperatively. Tracheotomy is often necessary and feeding by stomach tube essential for long periods, to prevent disastrous pulmonary complications.

After the removal of a cerebral meningioma, should the dural defect produced by excision of the attachment of the tumor to this menbrane be repaired by a fascia lata or temporal fascia graft? If the defect lies over the motor cortex, we like to sew in a graft on the theory that irritative convulsive attacks are less likely to occur postoperatively. In other cases, a graft may or may not be introduced. In this series, in 44 instances, a large dural defect remained after removal of the tumor. The excised dura was replaced by a graft in 26 instances. One of these, a patient in whom a fascia lata graft was used died of meningitis. But if the flap is wired and the galea and skin

are carefully closed it seems to make little or no difference whether or not the dura is repaired. In the last years, fewer bone flaps have been completely sacrificed. In 84 cases, complete sacrifice of the flap seemed indicated in 18. Whenever possible, that part of the bone grossly involved by the tumor is removed with the electric burr and the remainder of the flap replaced (see Fig 6 b). Our records show 7 cases in which this was done over 5 years ago, and no evidence of recurrence is apparent. The patient is often spared an unsightly cranial defect if part of the bone flap can be replaced. In 3 instances, the flap was removed, boiled at once for 3 minutes, and reinserted. One of these reinserted flaps was lost 2 months later from infection.

RESULTS

In this group of 149 meningiomas, there were 25 operative and 3 nonoperative deaths, a total of 28 in all. Of the 121 survivors, we have, through the efforts of the tumor registry been able to check accurately on 113. Eleven are known to have died since 1935 either from a recurrence of the tumor in 7 cases or from intercurrent disease in 4 instances. Among the 103 survivors, 34 are known to be alive and well and working at their previous or similar jobs, in as good physical condition as they were prior to the removal of the tumor. The breakdown of the figures in this group is given in Table I. It will be noted that in 31 of these 34 cases, the tumor was completely removed so that this group can be considered to have been cured and restored to their previous economic condition. In 3 instances, the tumor was partially removed and, therefore it may be presumed that a recurrence with return of symptoms can be expected.

In this group of 149 meningiomas, therefore 31 or 20 per cent, can be considered to have been completely relieved of all their symptoms following total operative removal of the tumor. Sixty-eight other cases survived but are handicapped by postoperative complications. Seventeen are incapacitated by loss of vision, present in each instance prior to operation to a greater or less extent. In 4 of those cases, high choked disc was recorded

GRANT INTRACRANIAL MENINGIOMAS SURGICAL RESULTS

preoperatively although visual acuity was adequate Following the removal of the tumor in spite of the relief of the pressure there was a continuation of the visual loss. In 31 cases the postoperative complication is convulsions attacks. In 21 of these cases convulsions were present preoperatively and postoperatively in 10 they developed as a result of the operative procedure Fifteen of these are men 16 are women The women can carry on their occupations as housewives etc. in a fairly satisfactory manner but the men have always been compelled to change their job owing to their convulsive attacks. In 15 of these cases the convulsions are well controlled by phenobarbital and occur only every 4 to 6 months. In the other 11 cases the fits are more frequent coming on on the average every 2 weeks

The 20 remaining patients, 13 women and 7 men are handicapped either because of a complete or partial hemiparesis or spasticity in the contralateral extremities. Here again 13 are able to live reasonably useful lives but 7 seem to be badly incapacitated

Considering the whole group of 149 patients 163 operations were performed with 25 deaths As has been stated 7 patients were operated upon in two stages, 4 patients were operated upon twice and 3 patients three times for recurrence The overall mortality is 15.5 per cent

From January 1 1936 to December 31 1940 79 operations were performed on 71 patients, with 17 deaths, a case mortality of 24 per cent and an operative mortality of 21 per cent. From January 1 1941, to December 31 1946 84 operations were performed on 75 patients, with 8 deaths a case mortality of 10.6 per cent and an operative mortality of 9.3 per cent. To April 1 1947 7 additional meningiomas have been removed without a fatality

In the last 82 cases, 93 operations have been carried out with 8 deaths, a case mortality of 9.7 per cent and an operative mortality of 8.6 per cent

CONCLUSION

A review of 10 years experience with 149 cases of intracranial meningioma indicates that by proper methods diagnosis and localization of the tumor can be correctly made in 98 per cent of the cases. Electrosurgical aids suction and especially preoperative and postoperative supportive measures, plus prompt and adequate control of intracranial pressure have reduced the operative mortality in recent years from 21 to 8.6 per cent These tumors are benign Complete removal with dural attachment, precludes recurrence The surgeon should always keep this fact in mind His problem is total extirpation of the tumor with minimum damage to adjacent brain areas thus reducing neurologic sequelae. In spite of electrosurgery suction ventriculography blood transfusions the record here presented might well have been improved if a more conservative attack, as represented by a two stage procedure had been employed with greater frequency The temptation to indulge in "brilliant surgery and the prompt one stage cancellation of a meningioma seems at times to be overwhelming But if the score' as represented by a lowered mortality rate is to be improved this impulse must be sternly suppressed

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THE RH FACTOR IN OBSTETRICS

Report of 572 Cases of Infants of Rh Negative Mothers 232 of
Whom Received Transfusions of Mother's Blood

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WITH the growth of our knowledge of the Rh factor have come tentative applications in the field of obstetrics. It is supposed for instance, that hemolytic disease of the newborn or erythroblastosis has its origin in a difference of the Rh factor in mother and infant. It is thought that the red cells in the fetal blood passing through the placenta and entering the mother's blood stream set up an anti Rh agglutinin which in turn passes back to the fetal blood. Given sufficient agglutinins some form of blood dyscrasia results, before, at or soon after birth with a high mortality in the case of erythroblastosis. This theory of the causation of hemolytic disease of the newborn has not yet been proved but a greater incidence of erythroblastosis in infants of Rh negative mothers than in infants of Rh positive mothers has been proved statistically. Hence it has become usual to expect erythroblastosis when an Rh negative mother has a history of loss of infants. Two prophylactic measures have been advocated: cesarean section at 8 months and cord transfusion at birth. If and when the disease becomes manifest transfusions are the treatment of choice.

Since difference in the Rh factor in the mother's blood is assumed to be the cause of the disease, great stress has been laid on giving the child not the blood of its mother but that of an Rh negative group O donor. The contention of this paper is that blood of the mother can and should be given and two series of cases are presented of infants of Rh negative mothers delivered in a 3 year period at the Methodist Hospital in Brooklyn. In the first, mother's blood was given prophylactically at birth in the second no prophylactic transfu-

sion was given and when transfusions were indicated donor's blood was given. In the first group of 231 infants living at birth, there were 9 deaths, 7 in prematures, 2 in full term. There were no deaths from erythroblastosis. In the second group of 322 infants living at birth there were 9 deaths, 2 in prematures, and 7 full term 5 of erythroblastosis, 4 of other causes. Of the 5 infants who died of erythroblastosis 4 received transfusions, 1 none. No untoward effects from the transfusions with mother's blood were noted, and in a few cases in which additional transfusions were needed and donor's blood was used, reactions were practically nonexistent, in contrast to the cases in which donor's blood was used exclusively.

A brief discussion is included of 20 cases of erythroblastosis that occurred earlier than the 3 year period reported in 9 the father's blood was used in 1 both the mother's and father's blood.

Six cases of possible blood dyscrasia in infants of Rh positive mothers, occurring during the period studied are also briefly discussed.

BLOOD STUDY

We have been criticized for giving the blood of Rh negative mothers, to their babies, but our excellent results have encouraged us to continue. We have had cases of severe reaction following the use of Rh negative donor's blood group O supposedly compatible, and not infrequently transfusions of donor's blood causes little or no change in the blood picture. In marked contrast, with the use of mother's blood no reactions occur and the blood picture improves promptly. In order to justify our use of Rh negative mothers' blood, we made the following blood studies.

In 200 of the babies of Rh negative mothers who received prophylactic cord transfusions of

From the Department of Obstetrics of the Methodist Hospital. This study was aided by a grant from the Dr. Edwin F. Lindridge Fund for research in obstetrical pathology.

TABLE IIB—PARITY OF RH NEGATIVE MOTHERS

Year	Mother's blood or no transfusion			Donor's blood or no transfusion		
	Primip.	Multip.	Total	Primip.	Multip.	Total
1944	23	47	77	27	23	50
1945	3	43	46	24	26	50
1946	8	31	39	20	24	44
	34	78	112	71	73	144

TABLE IIA.—RH FACTOR

Year delivered	Rh factor	Mother's blood cord transfusion				Donor's blood or no transfusion			
		Erythroblastosis		Prematures		Erythroblastosis		Prematures	
		Total	Number	Died	Number	Total	Number	Died	Number
1944	154	77			11	39	9	8	5
1945	53	46	1		3	46	8		7
1946	48	39	6			20	8	5	
	17	23	3		15	7	2		

were only 12 prematures in the group since most of the prematures received cord transfusions. There were 18 cases of erythroblastosis, with 5 deaths 4 transfused with donor's blood 1 not transfused. Fourteen cesarean sections were done in the group with loss of 3 infants, one a stillbirth the other from erythroblastosis. Another case of erythroblastosis with recovery occurred in an infant delivered by cesarean section. Conditions at birth were good 305 fair 15 critical 2 stillbirth, 18. There were 151 primiparas 189 multiparas (Table II)

ERYTHROBLASTOSIS IN INFANTS GIVEN RH NEGATIVE MOTHER'S BLOOD

Of the 232 infants of Rh negative mothers who received transfusions of mother's blood 13 or 6 per cent either showed evidence of blood dyscrasia or there was a history of it (Table III). Two of the babies had more than 50 normoblasts to the 100 white cells, and 6 had more than 15. Blood counts showed that 8 had 4,500,000 or less red cells and 5 of these were under 4,000,000. It is interesting to guess what the blood count would have been had these babies not been transfused. The hemoglobin was 110 per cent or under in 9 of the babies, and in 5 it was under 100 per cent. Eight of the babies were jaundiced and in 5 the jaundice was very marked.

The 13 mothers had a total of only 20 living children out of 31 pregnancies, and every one of the 13 was a multipara. Five had had 1 previous pregnancy three, 2 three, 3 one, 4 with no living children one, 7.

Of the 10 babies who received a cord transfusion 4 received additional transfusions of

Rh negative donor's blood 2 had 1 2 had 2 additional transfusions. It was noticed that there were no reactions to these transfusions of donor's blood. In the presence of erythroblastosis 3 infants not given transfusions at birth were given large transfusions intravenously 75 to 90 cubic centimeters intravenously several hours or days after birth, and all 3 received additional transfusions of donor's blood. There were no reactions to the mother's blood even in 1 case in which the mother's blood had a high titer of anti-Rh agglutinin (Case 3 following previously reported in 1946 6). In 1946 the last year of the period studied no additional transfusions were needed in babies receiving prophylactic transfusions of mother's blood.

All of the babies were discharged on or before the 14th day. The smallest weighed 5 pounds 5 ounces and was of 36 weeks gestation. Judging from the birth weights of these 13 babies, premature induction of labor when erythroblastosis is anticipated is not justified.

From the results it seems fair to conclude that cord transfusion prevents onset of the disease, and if it develops, hastens recovery. Since the disease can be anticipated more readily in multiparas, our tendency was to give prophylactic transfusions to infants of multiparas rather than of primiparas. In 1945 and 1946 134 infants of multiparas were transfused as compared to 21 of primiparas (Table IIB).

Of the following cases, the first 2 illustrate very probable aborted erythroblastosis in the first, the mother had a bad history and blood studies indicated prognosis of the disease in the second, the baby was active and in good shape in spite of some evidence of the disease. In the third and fourth cases the babies were not given prophylactic transfusions, but when

MAYES RH FACTOR IN OBSTETRICS

TABLE III.—ERYTHROBLASTOSIS, 13 BABIES TRANSFUSED WITH MOTHER'S BLOOD

Year	Hospital No.	Age of mother	Gest. date	Live inf. children	Normon.		R.R.C. million	Hb. %	Cord trans- fusion	Intra venous	Jaun- dice	Day of dis- charge	Birth weight	
					Cord	1st or 2nd day								
1944	26730A	5	II			29	3.8	94		80% Rh- 100% Rh-	XXXX	1	6-14	Baby made an excellent recovery
1944	26960	27	III			7	4	5	25	100% Rh- 100% Rh-	XXXX	14	7-8	Marked polikilocytosis. Anemia of the newborn
1945	27023	27	IV	2			4.8	98		80% Rh- 100% Rh-	XX		8-	Moderate anisocytosis.
1945	28065A	24	III			22	5.6	110		80% Rh- 100% Rh-	XXXX	4	6-14	Baby gained steadily after each transfusion.
1948	20457	20	II					8.1	40	100% Rh-	XXXX		0-0	Mother had high titer of anti-Rh agglutinins.
1945	2703A	3	II					2.8	00	60% Rh-	X		0-8	Marked jaundice. Spleen 1 1/2 fingers below costal margin.
1945	2723B	25	III					6	106	4	XXXX		7-7	Spleen 2 fingers below costal margin.
1946	20481	26	II					7.8	44	45			6-0	Baby very active in spite of severe jaundice.
1946	22068	5	II	2	32	20	7.8	44	45	20			8-3	Baby premature 36 weeks
1946	2776G	20	IV	4	23	77	4.4	06	20		XX		0-8	Mother had lost 3 children, which were stillborn.
1946	22778D	3						3.8	95	70			6-3	Mother had lost 3 children, 2 of twins.
1946	26337B	20	IV					6	63	34	40		7-	As only living child had had cord transfusion.
1946	26665A	20	IV			20		8.5	70	25			8-4	Baby had minor convulsions for 6 days. Normal at 6 weeks.

the disease developed the mother's blood was given with excellent results, in 1 case in spite of a high titer of anti Rh agglutinins.

CASE REPORTS (GROUP A)

CASE 1 Baby G 23279G This mother was a quintigravida, Rh negative with no living children and had been married 6 years. Her first pregnancy had ended in a 4 months miscarriage. In 1942 she was delivered of an 8 1/2 months baby which was not trans- fused and which died from erythroblastosis on the third day. In 1945 she had a 4 months miscarriage.

Her last child was born May 26 1946. The patient was now 32 had been pregnant 5 times, and had no living children. She came to me shortly after becoming pregnant and was given 30 minims of wheat germ oil daily 1/4 grain of protiodide of mercury twice daily and until the pregnancy had reached 5 months, 3 cubic centimeters of corpus luteum extract weekly by injection. The delivery was an easy Barton ro- tation of a right occiputposterior position and low forceps. The baby was immediately given 50 cubic centimeters of its mother's blood by cord trans- fusion. The baby was of 39 weeks gestation cried spontaneously had a good color and weighed 6 pounds 3 1/4 ounces. The mother was Rh negative the father Rh positive and the

baby Rh positive. The placental blood showed 3 800,000 red cells and the hemoglobin was 95 per cent. Following the transfusion the red cells were 4,050,000 and the hemoglobin 150 per cent. There were no normoblasts.

On the day following delivery the baby was slightly jaundiced and this increased considerably. There were also areas of ecchymoses over the body most noticeable on the extremities. In spite of the jaundice and the ecchymoses the baby seemed to be doing nicely and the red cells and the hemoglobin increased. On the second day following delivery the red cells were 5,700,000 and on the fourth 6,600,000 with a hemoglobin of 147 per cent. When the baby was 8 days old the hemoglobin was 136 per cent and the red cells 5,680,000. The baby was somewhat dehydrated on the fifth day and was given 50 cubic centimeters of saline solution by dlysis. The baby was breast fed and was discharged from the hospital on the eleventh day weighing 5 pounds 14 ounces. At the end of 6 weeks it was still breast fed and was doing nicely.

In anticipation of erythroblastosis I had had com- plete blood studies made in this case. The mother's blood was examined by Dr. Levine on four occasions before delivery and found to be Rh negative group O. Her husband was also group O but Rh positive and also Hr positive. This Dr. Levine thought con- firmed the prognosis of incompatibility of the in-

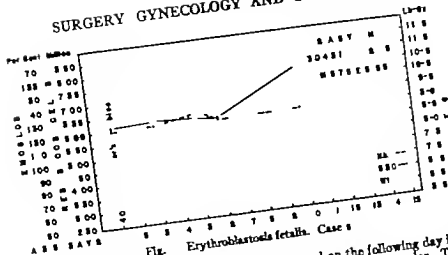


Fig. Erythroblastosis fetalis. Case 3

infant's blood. Three days before delivery Mrs. G's blood contained weak but distinct blocking antibodies and Dr. Levine thought there was a good possibility of an infant affected with erythroblastosis, but not too severely affected.

It is very hard to make a definite diagnosis of erythroblastosis in this baby. I am certain, however, it would have died from the disease had it not received a transfusion of Rh negative blood. Had the transfusion been delayed until definite symptoms of erythroblastosis developed, one transfusion would not have been enough to save the child, and if Rh negative blood from some other donor than its mother had been used there might have been incompatibility. Mother's blood is apparently always compatible and if there are anti-Rh agglutinins they do not seem to trouble the baby.

CASE 3. Baby M 30481 (Fig. 1) The mother of this baby was a secundigravida, primipara, 26 years old. The mother was Rh negative and the father Rh positive. She had had a normal baby in 1944. Her second child was delivered March 6, 1946 and was given 40 cubic centimeters of mother's blood by cord transfusion as a prophylactic procedure. The condition of the baby was good at birth. It weighed 6 pounds 9½ ounces, blood count showed 6,150,000 red cells, hemoglobin 103 per cent with 18 nucleated red cells. The following day the baby was extremely jaundiced but very active and otherwise seemed normal. It was breast fed. The red cells remained slightly over 6,000,000 until the eighth day, when they were 7,530,000, with 10 nucleated red cells. The baby was discharged on the 15th day having gained back its birth weight. If the jaundice in this case had been due to blood destruction, there should have been a decrease in the hemoglobin and red cell count. The jaundice must have been due to blocking of the bile ducts or damage to the liver from disease.

CASE 3. Baby A. 30557 This case has been previously reported in 1946 (6). The mother was thought to be Rh positive. No cord transfusion was given at birth. The baby soon became very jaundiced and seemed to be in critical condition supposedly due to an obstruction of the bile ducts. The baby was given 90 cubic centimeters of its mother's

blood, and on the following day it looked like a normal baby except for its color. The blood count was normal until the eighth day, when the red cells were 4,500,000 and the hemoglobin was 80 per cent. When the baby was 14 days old the red cells had dropped to 3,700,000 and the hemoglobin was 60 per cent. The baby was then transfused with 90 cubic centimeters of Rh negative blood from a compatible donor.

When the mother's blood was tested by Dr. Levine several days after the child's birth, it was found to be Rh negative with the high titer of 1:50. This baby was undoubtedly suffering from erythroblastosis and was cured by the use of the mother's blood which contained a high titer of anti-Rh agglutinins.

CASE 4. Baby F 24865. Mrs. F was a tertipara, secundipara, 34 years old, and Rh negative. She had had a normal baby in 1938, and in 1941 had toxemia of pregnancy was delivered at 8 months of a baby weighing only 3 pounds 10 ounces. On April 4, 1945 she was delivered of a male child weighing 6 pounds 14 ounces. The mother was thought to be Rh positive and no cord transfusion was given. Soon after birth the baby became very jaundiced, the hemoglobin was 96 per cent, red cells 3,500,000, and there were 30 normoblasts per 100 white cells. The baby was given 80 cubic centimeters of its mother's blood. There was no reaction, and the baby did well until it was 10 days old when the hemoglobin was 70 per cent, red cells 3,400,000. At this time a transfusion of 90 cubic centimeters of blood from an Rh negative donor was given, and the baby was discharged on the eleventh day weighing 8 ounces above its birth weight.

ERYTHROBLASTOSIS IN INFANTS NOT GIVEN RH NEGATIVE MOTHER'S BLOOD

There were 18 cases of erythroblastosis among the 340 infants not given transfusions of mother's blood. One died without receiving any transfusion and would probably have lived had it received a prophylactic transfusion of compatible blood (Case 10). In the re-

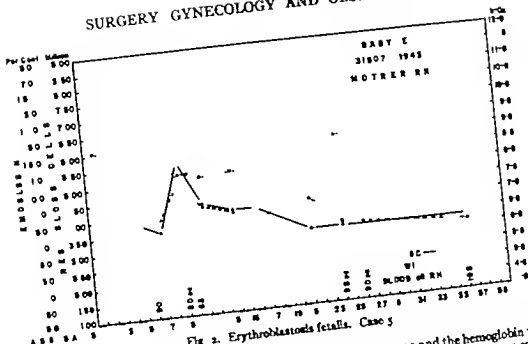


Fig. 2. Erythroblastosis fetalis. Case 5

the successful use of a prophylactic cord transfusion with donor's blood in the presence of possible erythroblastosis.

CASE REPORTS (GROUP B)

CASE 5. Baby E. 3 807 (Fig. 2) The mother of Baby E. was 34 years old secundigravida, Rh negative. She had 1 normal child, born in 1944. On December 25, 1945 she was delivered of a baby girl weighing 9 pounds 3 ounces. The child seemed perfectly normal at birth but 4 days later it was moderately jaundiced, the spleen was not palpable. The blood count showed 3,830,000 red cells and a hemoglobin of 98 per cent. There were no nucleated red cells. When the baby was 6 days old the red cells were 3,500,000 and the hemoglobin 76 per cent. The baby was given 90 cubic centimeters of Rh negative blood from a supposedly compatible donor. On the ninth day the baby was transfused with 80 cubic centimeters of Rh negative blood and with 65 cubic centimeters on the tenth but in spite of the 3 transfusions there was no increase in either the red cell count or the hemoglobin. The baby received 3 more transfusions and was discharged from the hospital on the 24th day. This baby received 6 transfusions for a total of 505 cubic centimeters of blood. In spite of the repeated transfusions the baby improved very little. On January 29, when the baby was 34 days old the red cells were 3,330,000 and hemoglobin 63 per cent.

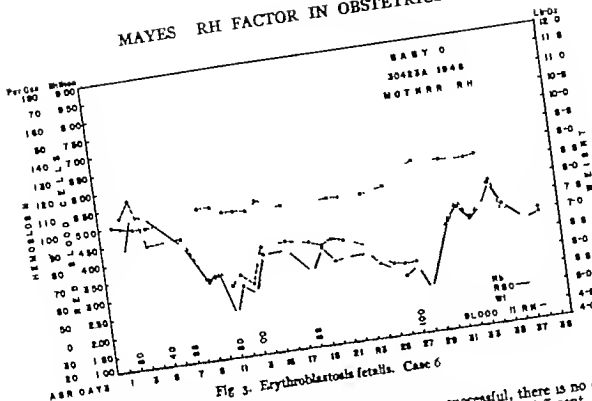
CASE 6. Baby O. 30423A (Fig. 3) The history of this baby and the results are very similar to those of the preceding case. The mother was 35 years old, secundigravida, unipara, Rh negative. She had had 1 normal pregnancy. On January 6, 1946 she was delivered of a full term female infant weighing 8 pounds 2 ounces. The blood count on the day following de-

livery was 4,150,000 and the hemoglobin 100 per cent with 10 normoblasts. The spleen was enlarged, and erythroblastosis was suspected. The baby was given 60 cubic centimeters of Rh negative blood. Following the transfusion the baby became very cyanotic and stopped breathing. Respirations were re-established with some difficulty. The baby received 20 cubic centimeter transfusion on the 5th day and 45 cubic centimeters on the 7th. The 3 transfusions had little effect on the blood count, and by the time the baby was 15 days old, the red cells were 3,700,000 and the hemoglobin 60 per cent. When the baby was 25 days old the red cells were 3,860,000 and the hemoglobin 60 per cent. The baby was discharged on the 36th day. The baby had a total of 7 transfusions and 460 cubic centimeters of Rh negative blood.

There is little doubt but that the Rh negative blood used for these two babies was not compatible. If the blood had been compatible the severe reaction would not have occurred in the second case and the repeated transfusions in both cases would have been unnecessary.

CASE 7. Baby B. 37142. This child's mother was a quartigravida, unipara 23 years old and Rh negative. She had had 1 normal baby and 3 miscarriages. A normal baby was born on March 23, 1946, weighing 6 pounds 15 ounces. At birth the blood count showed 5,720,000 red cells and 111 per cent hemoglobin, with 3 normoblasts. When the baby was 6 days old the spleen was enlarged, the hemoglobin was 98 per cent and there were 15 normoblasts. It was given 75 cubic centimeters of Rh negative blood. Four days following the transfusion the normoblasts were 37 per 100 white cells. When the baby was 15 days old the normoblasts had increased to 94. The hemoglobin was 98 per cent and the red cells 4,500,000. The baby was given another transfusion of 75

MAYES RH FACTOR IN OBSTETRICS



cubic centimeters of Rh negative blood. It is interesting that the normoblasts should increase following the use of Rh negative blood. It apparently indicates an incompatibility.

CASE 8. Baby D 19266A. This mother was 36 years old, quintigravida, quadripara group B Rh negative and her husband was Rh positive. The mother had had 4 normal deliveries, but following the last in 1944 she had 2 transfusions. Her fifth child was born October 4, 1946 a male child weighing 7 pounds 11 ounces. The baby's condition was good at birth. A cord transfusion of mother's blood was attempted and failed. The baby was found to be Rh positive. On the day following delivery the red cell count was 3,500,000 and the hemoglobin 94 per cent. On October 6 the hemoglobin was 45 per cent. The baby was jaundiced liver and spleen enlarged. The baby was cubic centimeters of Rh negative blood were 3,300,000 and 35 cubic centimeters of the red cells were 3,300,000 given. On October 7 per cent and 80 cubic centimeters of Rh negative blood were given. The baby received 75 cubic centimeters on October 11 85 cubic centimeters on October 17, and on October 23 80 cubic centimeters, for a total of 355 cubic centimeters of Rh negative blood. On October 24 the red cells were 3,600,000 and the hemoglobin 85 per cent. Following the last 2 transfusions the hemoglobin dropped in both cases. The baby was discharged from the hospital on the 21st day and its condition was good. There is little doubt that the Rh negative blood in this case was incompatible. It was probably the means by which the baby's life was saved however. The red cells remained in the circulation long enough to help the baby over the difficult period. The baby's serum and the mother's cells showed no agglutination. No antibodies could be demonstrated in the mother's blood. Had the cord transfusion with moth-

er's blood been successful, there is no doubt the results would have been quite different.

CASE 9. Baby M 32000. This patient was a secundigravida 28 years old Rh negative and her husband Rh positive. The patient had been operated on for a patent ductus arteriosus and had a severe reaction following a blood transfusion of Rh positive blood. Her own and her husband's blood were examined before her delivery by Dr. Levine he found her husband Rh positive and her negative so that all of the offspring would be Rh positive. The mother was immunized as indicated by blocking antibodies. It was almost certain that the baby would be affected with erythroblastosis. The patient was delivered on March 24, 1946. The baby was given 40 cubic centimeters of Rh negative blood from a professional donor by cord transfusion. The baby was normal with a red cell count of 7,940,000 and a hemoglobin of 140 per cent.

The following case is of interest. This baby received no transfusions.

CASE 10. Baby N 31633. This is the only baby to be lost from erythroblastosis during the year 1945. The mother was 29 years old, a tertigravida, secundipara Rh negative. The father a daughter and the baby were Rh positive. The baby's condition was good at birth. It was 39 weeks gestation and weighed 6 pounds 2 ounces. It was slightly jaundiced. The spleen was palpable 17 hours after birth the red cell count was 6,110,000 and the hemoglobin 120 per cent. There were only 2 normoblasts. When the baby was 2 days old it was still jaundiced the spleen palpable and the blood count 5,040,000 and the hemoglobin 102 per cent. When the baby was 3 days old the red cells were 5,200,000 and the hemoglobin 90

TABLE VA.—ERYTHROBLASTOSIS, 9 BABIES TRANSFUSED WITH FATHER'S BLOOD

Year	Hospital No.	Age	Gra- vity	Live- ing child- ren	Ker- mon	R.B.C. not day	R.B.C. low	Hb. 1st day	Hb. low	Num- ber of trans- fusions	Am- t. of blood	Date of dis- charge	Jaun- dice	
1926	8384	20	hi			9	7	97	27	7	215	24		Died at 22 months
1926	7422	20	l		12	8	2.6	78	45	5	275	16	xxxx	Died from pneumonia with dry
1926	9082A	20	vk			4.6	9	72	36	7	5	28		Labor induced at 36th month
1927	9093	21	l			1.9	3.3	704	75		40			Condition fair at birth. Spleen 15 inches below costal margin
1927	9060		hi		69	1.6		97			98		xxx	Died. Spleen and liver enlarged autopsy
1927	2721B	20	hi			1.6		7			95	2	xxxx	Died. Spleen much enlarged at au- topsy
1927	2029B	23	vi	1	93		3	82	82		82			Mild erythroblastosis in blood smear
1927	782 B	44		2	182	5	2	1	26		96	5		Meningitis. Died at about 1 year
1927	1874B	1	hi		677	3.6		70			53		xx	Pale, jaundice at birth. Died one year of R.B. blood

TABLE VB.—ONE BABY TRANSFUSED WITH BOTH FATHER'S AND MOTHER'S BLOOD

19	2442	20	hi		176			8	24	4	120			Mother's blood by cord, 97 Father's blood, 77 Mother's blood, 98 cc. 2, 50 Total mother's, 55
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per cent. There was some occult blood on the diaper. At this time the baby was seen in consultation with Dr. Weiner who diagnosed congenital hemolytic disease. He made this note: "If the hemoglobin drops to 80 per cent or below 60 cubic centimeters of fresh citrated blood 'O' Rh negative, or washed cells from an equivalent amount of mother's blood should be given." During this day the baby became much worse, the jaundice much deeper and the spleen had considerably increased in size during the last 24 hours. The baby died that night without receiving a transfusion. There is little doubt that this baby would not have died had it received an early prophylactic transfusion of compatible blood.

CEASAREAN SECTION IN RH NEGATIVE MOTHERS

In the group of 572 Rh negative mothers there were 23 cesarean sections, 9 in the group of 232 transfused with mother's blood and 14 in the 340 either nontransfused or transfused with donor's blood. In the group transfused with mother's blood there was 1 death the only case in which cesarean section was done prematurely to get a living baby the gestation was 34 weeks. There were 2 other small pretermatures 1 weighed 3 pounds 3 ounces and was of 36 weeks gestation, and the other weighed 3 pounds 12 ounces. Both survived.

In the group not given prophylactic transfusions of mother's blood there were 2 infant

deaths. In one, section was done for toxemia and the baby was stillborn. The other was of 39 weeks gestation it had 142 normoblasts and was transfused with 105 cubic centimeters of Rh negative donor's blood death occurred on the second day. This is the first case reported in Table IV. One other baby in this group developed erythroblastosis it was slightly jaundiced at birth and following 2 transfusions of Rh negative blood recovered.

There were 18 low classical cesareans and 5 low cervical. Ten were primary and 13 secondary. There were no maternal deaths. There were no maternal deaths in the entire group of Rh negative mothers.

It has been recommended if the mother has lost one or more children and is Rh negative, that a cesarean section be done at the eighth month in order to get a living child. I do not believe this is justified. If the baby is diseased you have not only a sick baby but also a premature one to deal with. As a rule the babies are in good shape at birth (see birth weights, Table III) but the disease develops rather rapidly and if no transfusions are given the baby dies about the third day. Immediate transfusion given as a prophylactic measure is far preferable to the use of cesarean section to insure a living child.

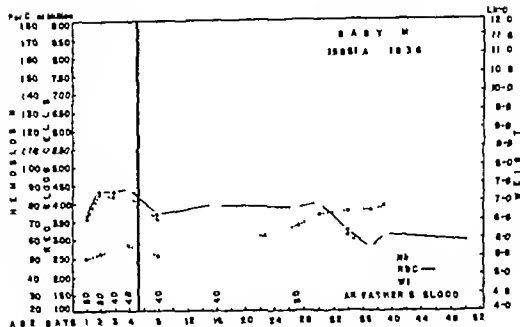


Fig. 4 Erythroblastosis fetalis, Case 21

PREMATURE BABIES AND THE RH FACTOR

In previous articles (5, 6) I have stressed the importance of using mother's blood for a cord transfusion when the baby is premature. If the mother is Rh negative and the baby is born prematurely, then we have double indication the transfusion will benefit the baby if it is premature and will protect it if there should be any tendency toward the development of erythroblastosis. There were 35 babies premature either by weight or gestation who received transfusions of mother's Rh negative blood with 7 deaths (Table IIA). Three of the babies were of 21 weeks gestation or less, 2 died from congenital anomalies, 1 following cesarean section of 34 weeks gestation mentioned and the remaining 1 weighed 3 pounds 9 ounces and lived only 1 hour.

In the group of babies not receiving cord transfusions of mother's blood there were 12 babies premature by gestation 37 weeks or under but only 5 by weight $5\frac{1}{2}$ pounds or under. Two of the babies died, 1 of 20 weeks gestation and 1 of 34 weeks which had a massive ventral hernia. The small number of cases in this group is explained by the fact that most of the prematures received cord transfusions

TRANSFUSIONS WITH FATHER'S BLOOD

It is of some interest to compare the findings of the 3 year period studied with 10 cases

that occurred between 1936 and 1942 in which father's blood was used (Table V). In 1936 nothing was known of the Rh factor nor were we giving prophylactic transfusions of mother's blood to infants other than prematures unless the mother had lost one or more babies from erythroblastosis. There is little doubt that these 10 babies were suffering from some form of blood dyscrasia. Father's blood was used because in some cases the mother was not considered a suitable donor, the father's blood was easily obtainable and the relationship might make the blood compatible. In 9 cases father's blood was used with transfusion of donor blood in 1 case in the tenth mother's blood was given by cord transfusion, one transfusion of 75 cubic centimeters of father's blood on the 2nd day and mother's in transfusions on the 5th and 9th days. The Rh factor was determined in only 2 of the 10 babies.

Of the 9 babies who received father's and donor's blood 5 had more than 50 normoblasts, 4 more than 100 and 2 more than 200. Red cells were less than 4,500,000 in 4 and 7 had a hemoglobin of less than 100 per cent. Six were jaundiced, 2 markedly. The 9 mothers had a total of 23 previous pregnancies with 14 living children. Seven were multiparas.

A total of 29 transfusions was given, 1 had a total of 5, 2 a total of 7. One baby was in the hospital for 38 days and 1 for 54 days.

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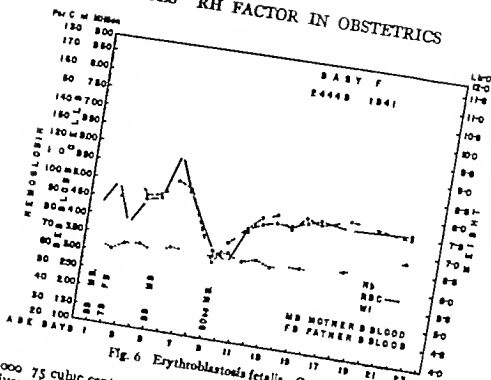


Fig. 6 Erythroblastosis fetalis. Case 13.

white cells to 178 000 75 cubic centimeters of father's blood were given following this the red cells dropped over a million cells On the fifth day the baby was given 50 cubic centimeters of mother's blood and on the ninth day 80 cubic centimeters of mother's blood. The hemoglobin and red cells remained up and when the baby was 20 days old the red cells were 4,500,000 and the hemoglobin 94 per cent. The baby weighed 6 pounds 13 ounces and was a normal baby

In this case the father's blood did not help the baby but the 2 following transfusions from the mother who must have been Rh negative, were enough to keep the blood count at a satisfactory level

ERYTHROBLASTOSIS IN INFANTS OF RH POSITIVE MOTHERS

A comparatively small number of the babies of Rh negative mothers develop erythroblastosis of the 533 living infants of 572 Rh negative mothers delivered in a 3 year period only 31 or 5.8 per cent had erythroblastosis or some blood dyscrasia. The disease occurs even less frequently in infants of Rh positive mothers. Of the 5917 Rh positive mothers delivered in the same period only 6 of the babies had erythroblastosis or it was suspected erythroblastosis might develop (Table VI)

Two of the 6 babies had more than 15 nor-moblasts red cell count was less than 4 500 000 in 1 and hemoglobin less than 100 per cent

in 1 Two of the mothers were primiparas The 4 multiparas had had 12 previous pregnancies with 3 living children

Five of the babies were transfused with mother's blood receiving a single transfusion One received 3 transfusions of donor's blood total amount 200 cubic centimeters. This baby had the longest stay in the hospital 24 days. All recovered

LITERATURE

Many articles have been written concerning the Rh factor in obstetrics and the great majority of them stress the importance of giving the baby of an Rh negative mother transfusions of O Rh negative blood They also oppose the use of mother's breast milk. Leonard reported from the New York Hospital 55 cases of hemolytic disease with a mortality of 34 per cent 44 per cent of the babies had a nonspecific diarrhea. It is possible this might have been due to the fact that the babies were not breast fed and had difficulty in establishing proper intestinal flora. Two of the babies received transfusions of mother's blood when 5 to 7 days old no ill effects were noted and there was an increase in hemoglobin. One hundred seventy three transfusions of blood of an unknown Rh factor were given and 80 to 90 per cent of these must have been Rh positive. In 2 cases death followed

TABLE VI.—INFANTS OF RH POSITIVE MOTHERS TRANSFUSED WITH MOTHER'S BLOOD OR DONOR'S BLOOD BLOOD DYSKRASIAS SUSPECTED

Year	Hospital No.	Infant's age	Gravida	Living children	Mother	R R C per day	R R C. low	Mth. % at day	Mth. % low	Number of transfusions	Ampt. of blood	Day of discharge	Birth weight	
1944	34669		I		53	6.3	6	30	30		73M		8-14	Vernix yellow Transfused in 1 hr. Mother's blood used
1945	3914C	29	IV		2	6	6	44	26		5M		3-6	Husband Rh positive Only living child had cord transfusion
1945	327 SC	34				6.7		107			40M	3	6-9	Husband Rh pos. Only living child had cord transfusion
1948	3 18	5	IV		5			20			25M		6-8	Normal baby Husband Rh pos. One baby died 1 week post Two had been lived only few hrs
1949	40850C	34				7.6		47			30M		6-9	Normal baby Husband Rh pos. 1945 Polyhydramnios. S.R.
1949	21 7E	20	I		4	2.7	20	90	90	1	200D	24	3-7	Parents and baby all Rh pos. This was only baby in group receiving more than one transfusion

*M—mother's blood
D—donor's blood

the transfusion and may have been caused by it. Forty transfusions of Rh negative blood were given and in 1 case the transfusion was followed by cyanosis bloody nasal discharge hematuria, and death in 48 hours.

Litchfield reported 3 cases of erythroblastosis in 1945. One of the babies, which was not transfused until it was 24 hours old had 4 transfusions of Rh negative blood and 90 cubic centimeters of plasma from a compatible Rh negative donor. The baby stopped breathing following the transfusion of the plasma but was revived by artificial respiration and adrenalin. The baby died 24 hours later. The following note is made: "Despite the transfusions the infants became progressively worse. There is little doubt that transfusion reactions and factors other than the Rh prevented this infant from making a recovery." He reports that of 40 newborn infants who developed erythroblastosis, anemia or jaundice, 11 died.

Harville reported a case of erythroblastosis in which labor was terminated at the 8th month by cesarean section. Immediately following delivery the baby was given a cord transfusion of 60 cubic centimeters of Rh negative blood. The baby was given 2 more transfusions. The baby was normal in all respects. He comments as follows: "Cord transfusion hitherto neglected in these cases is an important adjuvant procedure in the management of the prematurely delivered erythroblastic infant."

Rh positive blood can be used to treat erythroblastosis, according to Danis *et al*. If the red cells are concentrated by siphoning off the majority of the plasma. He also states that we are impressed repeatedly with the results obtained with the use of father's blood. In many cases where the obstetrician had given one transfusion of father's blood before the patient came to us the results were quite remarkable.

Cold agglutinins described by Sanford and Gerstley accounted for the hemolysis following the use of Rh negative and Rh positive blood. At a temperature of 0 degrees Centigrade the cells would agglutinate, but at 20 or 30 degrees Centigrade there was no agglutination. He reports an infant recovering after 21 transfusions for a total of 2,300 cubic centimeters of blood over a period of 33 days.

If we are to judge from these reports and many others where reactions have followed the use of Rh negative blood then it would seem that Rh negative blood from a donor other than the baby's mother must frequently be incompatible and at times its use causes such a severe reaction that the baby dies.

COMMENTS

Our experience at the Methodist Hospital, Brooklyn has been quite in contrast to that of the great majority who have written about the Rh factor and its effect on the newborn. We have been led to believe that the Rh fac-

tor although important in erythroblastosis is not the exciting factor. If it were certainly many more babies of Rh negative mothers would develop the disease. Moreover if the anti Rh agglutinins in the mother's blood cause the hemolysis in the baby's blood we would be unable to give the mother's blood freely as we have done.

Most of the babies in the cases reported nursed their mothers without any untoward symptoms. No one has proved that anti Rh agglutinins in the mother's breast milk are absorbed from the infant's intestinal tract or that they are not destroyed by the intestinal ferments. The baby is apparently better off with its mother's milk, in spite of the anti Rh agglutinins it may contain.

When blood other than the mother's is used for transfusion of the infant there is a chance that the baby will be benefited. Reactions are quite common however and may be so severe that the baby will succumb during or soon after the transfusion. If the blood is incompatible there may be considerable loss in red cells and hemoglobin but in spite of this the baby is temporarily benefited. Repeated transfusions however are necessary to keep the baby alive even then red cells and hemoglobin may not be increased because of incompatibility. Crossmatching to determine compatibility is impractical since it is difficult to get sufficient blood from the baby unless blood is taken from the placenta at the time of delivery. Donor blood could be matched with that of the mother before the baby is born and if compatible could be given by cord transfusion at delivery.

SUMMARY

1 During the years 1944, 1945 and 1946 at the Methodist Hospital in Brooklyn Rh factor determinations were made in 7032 women and 142 or 14.7 per cent were found to be Rh negative.

2 In the same period 572 Rh negative mothers were delivered. Somewhat less than half 232 received transfusions of mother's blood 229 by cord at birth 3 later intravenously with the loss of no viable baby from erythroblastosis. In the group of 340 not receiving mother's blood there were 5 deaths

from erythroblastosis 4 received donor's blood 1 had no transfusion.

3 Comparison was made between the blood of 100 babies who received cord transfusions of Rh negative mother's blood and 100 babies not cord transfused with Rh negative mother's blood. The transfused babies had an average of 678,000 more red blood cells than the non-transfused babies.

4 A study of the compatibility of Rh negative mother's and baby's blood showed that in 80 cases there were only 10 in which there was any agglutination when the mother's cells and baby's serum was used. One baby transfused with incompatible mother's blood had no reaction.

5 A study of the compatibility of Rh positive mother's and baby's blood showed 6 in 46 cases in which agglutination occurred when mother's cells and baby's serum was used.

6 There were 13 cases of erythroblastosis or suspected erythroblastosis in which transfusions of mother's blood were given 10 by cord at birth 3 intravenously later. There were no reactions and no deaths. These 13 infants all had some blood dyscrasia or the mother had a history of losing babies from erythroblastosis.

7 There were 17 babies with erythroblastosis transfused with blood of Rh negative group O with the loss of 4 babies in 3 of whom there was severe reaction. In 9 of the 17 more than 1 transfusion was necessary.

8 A brief report is made of father's blood given before the 3 year period reported 9 babies received father's and donor's blood 1 both mother's and father's blood. Of the 9 3 died on or before the 3rd day 1 on the 16th day 2 died before their 2nd year leaving only 3 survivors. A total of 29 transfusions was given. The 1 infant who received mother's and father's blood had 4 transfusions, 3 of mother's blood 1 of father's with no help from the father's blood. This infant survived.

9 Results obtained from Rh negative donor's blood and father's blood were somewhat similar. More reactions occurred immediately following transfusion in infants given donor's blood but with both more transfusions were needed and more deaths occurred. Apparent incompatibility was common.

10 There were 6 cases of possible blood dyscrasia with recovery in babies of Rh positive mothers. Five were given a single transfusion of mother's blood 1 received 3 transfusions of donor's blood with a total of 200 cubic centimeters. Four of the 6 mothers were multiparas and had lost 11 babies.

ADDITION.—We have transfused 31 additional babies using mother's Rh negative blood since January 1947 there were no reactions and not one of the babies required second transfusion. One of the babies had 40 normoblasts in the cord smear. This makes total of 263 babies receiving

mother's Rh negative blood with the loss of no babies from erythroblastosis.

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PATHOLOGICAL ASPECTS OF DEATH FOLLOWING MAJOR SURGERY

An Analytical Study of Postmortem Examinations of 57 Cases

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DEATHS following major surgery have been reduced to a low level in the general hospitals of this country in the past decade (1, 2). Improved surgical technique, good preoperative and post operative care together with cautious selection of cases have all played a part in achieving the present low mortality rate following surgery. The surgeon, the internist, and the general practitioner are all directly concerned in the problem of death following major surgery. They are often called upon to evaluate the risk of surgery before operation and to anticipate the complications that may arise during surgery or in the postoperative period. It would seem logical to assume that one of the best ways for the physician to learn to make an accurate estimate of risk and learn to anticipate complications in individual cases would be to present an analysis of unselected post operative deaths in general hospital surgical services and to analyze the anatomic lesions found at autopsy in these cases. The presentation is primarily from the standpoint of pathologic anatomy but some clinical correlations have been attempted. Our plan is to present the statistical data without comment then to

discuss the data in the same order and finally to present a summary and conclusions.

MATERIAL

All hospital deaths following major surgery in 2 general hospitals during the years of 1943 to 1945 inclusive were reviewed and those in which autopsy was performed were selected for analytical study. A few cases were excluded where permission for autopsy was partially limited or where clinical data were so poorly recorded that correlation with pathologic findings was useless. Only those patients dying in the hospital during the same admission when surgery was performed are included in this study.

PRESENTATION OF DATA

The total major surgical procedures recorded by the hospitals during the study period was 5,699. In this group there was a total of 138 deaths, or a total mortality rate of 2.4 per cent. In this group of 138 deaths there were 64 autopsies or an autopsy rate of 45.6 per cent. During the same 3 year period, the average autopsy percentage for all deaths occurring in the same hospitals was 50 per cent (Table I).

TABLE I.—SUMMARY—1943-1945 INCLUSIVE

Total major surgical procedures	569
Total deaths after major surgery	138
Total autopsies on patients dying after major surgery	64
Autopsy percentage in above group of post operative deaths	45.6
General autopsy percentage	30
Number of autopsy cases analyzed	57

TABLE II.—AGE OF PATIENTS

Age, years	No. of cases
Less than 1	2
1 to 9	0
10 to 19	5
20 to 29	1
30 to 39	1
40 to 49	7
50 to 59	7
60 to 69	17
70 to 79	10
80 and over	9
Total	57
31 males, 26 females	

A group of 57 cases in which postmortem examinations were made were selected for analytical study. These included 31 males and 26 females. The ages ranged from newborn to 89 years (Table II). The general types of operation are listed in Table III, together with the number of each. There were 19 different general classifications of surgical procedures and a total of 66 procedures on the 57 patients (since some patients had more than one procedure or more than one operation). There were 7 patients who had had more than one separate operation. Of the 57 patients operated upon the operation was classed as an emergency procedure by the authors (after review of the clinical data) in 29 of the cases.

The anesthetic agents employed were cyclopropane, 35; ether, 2; pentothal sodium, 2; spinal (procaine), 3; local, 2; pentothal sodium and cyclopropane, 5; and other combinations of those noted, 8 (Table IV).

The number of days after surgery that death occurred is listed in Table V. One can see that 44 of the 57 deaths (77%) occurred within the first 2 weeks after surgery.

Study of the clinical records reveals that there were recorded preoperative and postoperative diagnoses in all but 3 cases and that there was excellent agreement between preoperative, postoperative, and surgical pathological diagnoses, as shown in Table VI, how

TABLE III.—TYPES OF OPERATION

Type of operation	Number of patients
Enterostomy	13
Resection (bowel or stomach)	8
Exploration and biopsy	6
Hernia repair	5
Exploration and suture of perforated viscus	4
Exploration and drainage of peritoneal cavity	4
Suprapubic operations	4
Transurethral resections	4
Appendectomy	3
Cholecystectomy	3
Exploration and releasing of adhesions	3
Cholecystostomy	2
Amputation of penis	1
Pinning of fractured hip	1
Nephrectomy	1
Subtemporal decompression	1
Radical mastectomy	1
Interposition and vaginal plastic operation	1
Hysterectomy	1
Total	66
Operation classed as emergency	29
More than one separate operation	7

*Some patients had more than one procedure or more than one operation.

ever the clinical records were found to be deficient when a search was made for a record of the clinical cause of death. No clinical cause of death was recorded in 31 cases. Of the 26 where some record of clinical cause of death was made, it agreed with the autopsy findings in 20 cases and disagreed in only 6.

The actual analysis of autopsy findings was found to be difficult to present in a way that would have any meaning. We found immediately that a simple tabulation of major anatomic lesions found at autopsy was very un-revealing and confusing. For example the heading 'peritonitis' without individual case comment meant nothing and could refer to postoperative peritonitis due to error in surgical technique, or could mean perforation of a bowel carcinoma after simple exploration and biopsy. Also, for example the heading

TABLE IV.—ANESTHETIC AGENTS

Anesthetic agent	Number of cases
Cyclopropane	35
Ether	2
Pentothal sodium	2
Procaine (spinal)	3
Procaine (local)	2
Pentothal and cyclopropane	5
Other combinations of above	8
Total	57

TABLE V.—DAY OF DEATH AFTER SURGERY

	Number of patients
Day of operation	4
First day after	6
Second day after	6
Third day after	3
Fourth day after	4
Fifth day after	4
Sixth day after	—
Seventh day after	4
8th to 14th day after	—
15th to 21st day after	3
22nd to 28th day after	3
Over 28 days after	5
Total	57

TABLE VI.—CLINICAL RECORDS

	Number of cases
Chart record	—
Preoperative diagnosis recorded	54
Postoperative diagnosis recorded	49
Tissue removed and surgical pathological examination made	35
Preoperative or postoperative diagnosis agreed with surgical pathological diagnosis	26
Clinical cause of death recorded	25
Clinical cause of death agrees with pathological anatomy findings	20

hemorrhage might mean surgical hemorrhage or hemorrhage because of a primary disease unrelated to surgery. Thus, while we have listed the causes of death as recorded at autopsy (Table VII) we feel that this is of little value. Therefore we tried to classify each death in a more analytical manner as due to (a) operative factors (shock hemorrhage, peritonitis evisceration anesthetic) and (b) nonoperative factors (pulmonary embolus heart disease other new disease occurring in postoperative period continuation of disease treated, diagnostic error with death from untreated disease). The division figures for each of these is given in Table VIII. These headings, while quite general, are much more revealing and meaningful from an analytical standpoint and serve to give a fair interpretation of the types of postoperative deaths based on postmortem studies.

The final item in this presentation of material and of figures deals with the incidental or other anatomic lesions found at autopsy which are not included in Table VII because they were not concerned directly with the clinical postoperative course or the death of the patient. These so called 'incidental findings' are given in Table IX.

TABLE VII.—MAJOR ANATOMIC LESIONS

General classification of cause of death	Number of cases
Peritonitis	14
Heart disease	13
Pulmonary embolus	10
Pneumonia	7
Carcinoma	6
Hemorrhage	4
Surgical shock	3
Urinary tract infections	3
Liver disease	3
Trauma (multiple wounds, etc.)	3
Mesenteric thrombosis or embolus	1
Mediastinitis (rupture of esophageal ulcer)	1
Acute hemorrhagic pancreatitis	—
Paralytic ileus (noninflammatory)	—
Acute ileitis (chronic ulcerative colitis)	—
Volvulus	—
Total	71

(Some cases are listed under more than one classification)

TABLE VIII.—ANALYTICAL CLASSIFICATION OF CAUSE OF DEATH

Operative factors	Nonoperative factors
Peritonitis (surgical) 4	Heart disease 14
Hemorrhage 7	Pulmonary embolus 10
Shock 7	Other diseases developed in postoperative period 14
Evisceration 1	Continuation of disease treated 14
Anesthetic 1	Preoperative and postoperative diagnosis not made or in error and therefore, disease not treated 1
Total 5	Total 43

DISCUSSION

In discussing the data presented above, the first item deserving of comment concerns the total mortality figures of 2.4 per cent for the 5 699 major surgical procedures. This is somewhat difficult to compare with other studies because of the few published statistical data.

TABLE IX.—IMPORTANT "INCIDENTAL FINDINGS AT AUTOPSY APPARENTLY UNRELATED TO CAUSE OF DEATH

Incidental findings	Number of cases
Pulmonary tuberculosis (active)	1
Early cirrhosis of liver	1
Carcinoma of bronchus	1
Carcinoma of kidney	1
Glomerulonephritis (chronic)	1
Focal pancreatic necrosis	1
Bronchiectasis	1
Chronic lymphatic leucemia	1
Total	8

TABLE XL.—DEATHS FROM NONSURGICAL DISEASES APPEARING IN POSTOPERATIVE PERIOD EXCLUDING HEART AND PULMONARY EMBOLUS

Disease	Number of cases
Pneumonia	6
Chronic duodenal ulcer with hemorrhage	1
Portal cirrhosis	1
Subacute yellow atrophy of liver	—
Carcinoma of lung	—
Total	6

tinal obstruction often due to malignant neoplasm and sometimes accompanied by resection of a portion of gastrointestinal tract. The resection group was the second largest group followed by combined exploratory laparotomy and biopsy.

In this phase of the discussion we feel that it is important to point out the fact that in 57 deaths, 7 had had more than one separate operation during their hospitalization. This does not include multiple procedures done at one time (such as bilateral hernia repair, cholecystectomy and appendectomy etc.) but operations done on different days. Some were part of multiple stage procedures, some elective multiple operations, and others were reoperated upon because of some difficulty arising after the first operation (not including two eviscerations). It would seem that this figure of over 12 per cent of the total postoperative deaths having more than one surgical procedure would point out a definite hazard and one which many times could be eliminated by choice.

Along the same line is the fact that 29 of the 57 (51%) were classed as emergency procedures by the authors after review of the clinical records. Using the definition that an emergency is an unforeseen circumstance that necessitates immediate action to attempt to save life, there probably is little that can be done to eliminate this hazard. However the immediate action taken doesn't always have to be surgery. Judicious use of conservative means in an effort, first to carry out the laboratory and clinical tests necessary to obtain a more definite diagnosis, and second to administer supportive therapy methods to get the patient in as good condition preoperatively as possible, will always be justified. The pathol-

ogist rarely does an autopsy on a patient who dies because an operation was too long delayed (i.e. few hours to few days) but he frequently sees the poor results from operations attempted before adequate diagnostic methods, conservative and supportive therapeutic measures have been carried out. Of necessity some situations demand immediate operation and also of necessity some surgery must be done without a definite diagnosis, but our study shows that this emergency group comprises over half of the postoperative deaths in which autopsies were done and therefore points the way to caution.

Since there were no deaths attributed primarily to anesthesia, no comments regarding anesthetic agents will be made other than those given in Table IV.

The number of days after surgery when death occurred is given in Table V. Forty-four or 77 per cent occurred within the first 2 weeks after surgery. We have no further comment to make on this fact.

The study of clinical records deserves only brief comment. Most were found quite complete except for lack of written note regarding the *clinical cause of death*. This is an important omission for the clinician has thus missed an opportunity to test his diagnostic acuity and has failed to record in the chart evidence of his interest in the case even though the outcome was unfavorable. He has not given the pathologist a preautopsy statement as to what problems he specifically is concerned with and thus perhaps makes the autopsy less revealing. This is an omission of recording that can easily be remedied to the advantage of all concerned.

In discussion of the causes of death as listed under the general headings of operative factors and nonoperative factors (Table VIII) it is striking to note the relatively few operative factors. The subheadings under this group are quite clear cut and need no detailed comment. Many were present in combination with nonoperative factors.

The various subdivisions under nonoperative factors will be considered in some detail. The first heading of *heart disease* consists of 12 cases in which the autopsy findings indicated that heart disease was the immediate or chief

cause of death or at least one of the major factors in death. More detailed information regarding these cases is given in Table X. The one thing that stands out most prominently is the occurrence of a combination of cardiac hypertrophy and rather severe coronary arteriosclerosis in 8 of the 12 cases. While a high incidence of coronary arteriosclerosis might be anticipated in this age group, it would appear that the presence of the two was a definite hazard in the group of postoperative deaths studied. In addition to the 12 cases tabulated in Table IX, there were other evidences of cardiovascular disease in several others of the entire group of 57 cases. Excluding the 12 referred to, there were 8 additional cases in which the heart was definitely hypertrophied at autopsy (450 grams or more); 7 additional cases in which coronary arteriosclerosis was grade III or more (2 with both hypertrophy and coronary sclerosis) and 9 additional cases in which there was clinical hypertension. In all there were 16 patients in addition to the 12 primary cardiac deaths that had either cardiac hypertrophy (over 450 grams), coronary sclerosis of at least grade III, clinical hypertension or some combination of the three. This makes an overall total of 27 patients or 49 per cent of those dying after major surgery who had clinical or anatomic evidence of cardiovascular disease.

The next item under nonoperative factors is that of pulmonary embolus. There were 10 cases in which pulmonary emboli were present. Five of these were uncomplicated by any other significant findings and 5 others were found in association with other factors considered definitely related to the patients' deaths. The 5 deaths due entirely to massive pulmonary embolus occurred 6, 10, 12, 13, and 17 days after surgery.

Under the heading of *other disease* occurring in the postoperative period we have listed 10 cases. Some of the disease processes were undoubtedly present before surgery, but are included in this group. Table XI lists the chief features of this interesting group of postoperative deaths. Six were pneumonias of severe type and serve to stress the fact that some pneumonias in the postoperative period do not respond to chemotherapy. In one interesting

TABLE XII—DEATHS FROM UNTREATED DISEASES DUE TO DIAGNOSTIC ERROR OR NO DIAGNOSIS MADE

Apparent Clinical Diagnosis	Pathologic Anatomy	N. of cases
Acute intestinal obstruction	Periampullar abscess—Olecs	
Acute pancreatitis	Mesenteric thrombosis	
Mesenteric thrombosis	Salmonella typhimurium	1
Perforated duodenal ulcer	Perforated esophageal ulcer	1
Obstructive jaundice	Hepatitis and cirrhosis	1
Probable strangulated hernia	Post-traumatic infection (fracture femoral vertebrae)	1
Total		7

case in which the patient died less than 24 hours after surgery, there was found such extensive pneumonia with abscesses that it was apparent that the process had been present before the operation. The case of hemorrhage from a large chronic duodenal ulcer (occurring during patient's convalescence from nephrectomy) serves as a most pointed example (as do all these nonoperative deaths) that a single history and physical examination on admission to a hospital may not be all revealing. It should never be assumed that because a patient does poorly after surgery that the cause is directly related to his operation. A fresh start and reconsideration of the case as if it were a new admission is sometimes indicated.

The group of cases listed as *continuation of the disease treated* needs very little comment. It includes that large group of palliative surgical procedures in the noncurable stage of carcinoma and those unsuccessful attempts to save life in mesenteric thrombosis, acute hemorrhagic pancreatitis, severe trauma, etc.

Finally, we have 7 cases in which it appeared from the records that preoperative and operative diagnoses were not definitely made or were in error and death was due to continuation of untreated disease, i.e., untreated because not diagnosed. In some of these cases the patients were almost in *extremis* when admitted and no opportunity for adequate study was possible; yet it appeared that surgery was justified. Some of these represent the most difficult diagnostic problems and are listed factually with no intent to criticize. Table

XII lists the apparent clinical diagnosis first and opposite this the anatomic findings as revealed by autopsy. Fortunately these cases are uncommon but the occurrence of 2 cases of perinephric abscess due to long standing renal lithiasis and pyelonephrosis presenting themselves for the first time with signs of acute intestinal obstruction shows the diagnostic difficulties offered to the clinician and surgeon.

In concluding this discussion we refer to Table IX which lists so called incidental findings, unrelated directly to the cause of death. These findings sometimes are more important to the survivors of the deceased than the other observations and in the cases of pulmonary tuberculosis may actually be of prophylactic value. It serves to stress the fact often overlooked that the purpose of the autopsy is not alone to determine the cause of death but also to record evidence of past diseases and of those diseases which might have been yet to become active had the patient lived.

SUMMARY AND CONCLUSIONS

1 The risk of death following major surgery in this community is low and apparently compares favorably with reported incidences of postoperative deaths from other institutions.

2 Autopsy percentage in postoperative deaths is nearly as high as in all hospital deaths in this community.

3 This group of postoperative deaths includes a relatively large number of so called emergency procedures and also a relatively large number of patients submitted to more than one operative procedure at a single hospitalization. These observations suggest that reasonable delay in an effort to make a more

accurate diagnosis and to allow time for general supportive therapy is justified. It would appear that multiple elective procedures at one hospital stay is an avoidable hazard.

4 There are relatively few deaths in this group due to purely operative or technical factors and none primarily due to anesthesia.

5 Most deaths in this study were due to nonoperative factors and while heart disease, pulmonary embolus, and unsuccessful removal of pathological processes by surgical methods accounts for most of these, there are some deaths due to other diseases which developed or occurred in the postoperative period or which were undiagnosed at operation and tax the diagnostic ability of surgeon and clinician. A recheck of the postoperative patient who is not doing well with the thought in mind that there may be present a disease process wholly unrelated to surgery would undoubtedly yield much information.

6 Nearly one half of the patients dying after major surgery in our study had clinical or anatomic evidence of cardiovascular disease. Except for an indication that coronary arteriosclerosis combined with cardiac hypertrophy is a hazard this study helps very little to solve the question of which cases of compensated cardiac disease, if any should avoid elective surgery.

7 One deficiency in clinical records was the lack of any recorded statement in regard to the clinical diagnosis of cause of death. The importance of this omission is discussed.

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A STUDY OF SYSTOLIC BLOOD PRESSURE AND PULSE RATE IN TRAUMATIC SHOCK

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IN the conventional description of the clinical picture of traumatic shock prevalent in textbooks and medical literature the systolic blood pressure is recorded as low and the pulse rate as rapid. A value of 80 or below for systolic blood pressure is often taken as indicative of shock following trauma and the pulse rate is expected to be correspondingly elevated. In a fairly large civilian and military surgical experience the authors have come to believe that the clinical features of the state of traumatic shock are considerably less constant than is usually supposed. One or more of the characteristic clinical findings considered as having diagnostic and prognostic value may be absent in a patient whose condition in general presents unmistakable evidence of the state of traumatic shock. The conclusion is forced upon one that the essential disturbances of the condition such as reduction in cardiac output, reduction in peripheral blood flow and tissue anoxia are not always accompanied by the same signs. In fact the essence of the state of traumatic shock would seem to lie in the labile and transitory nature of the adjustments achieved by the organism and variation rather than constancy should be expected in its clinical manifestations. The point is of more than academic interest both to physiologists and clinicians. Accordingly it seemed worth while to attempt an evaluation of two of the reactions which are widely regarded as of critical interest in the diagnosis and prognosis of shock, namely the systolic blood pressure and the pulse rate. Rather complete notes on a group of severely wounded soldiers afforded suitable data for assay.

Detailed and careful personal observations had been made on several hundred seriously wounded soldiers treated as nontransportable

casualties at forward field hospitals. From these cases 204 were selected for study, all suffering from penetrating or perforating wounds from high explosive missiles and all presenting the clinical picture of actual or imminent shock. All had grave wounds of chest, abdomen, major bones and joints or combinations of these wounds. The amounts of plasma and blood given at various intervals had been recorded as well as the time between wounding and admission to field hospital, the time between admission and surgical operation and

TABLE I.—PLASMA AND BLOOD ADMINISTERED TO 204 GRAVELY WOUNDED SOLDIERS AND TIME INTERVALS

Intervals	Plasma				Blood			
	No. of observed cases	Average amount in liters	No. of observed cases	Average amount in liters	No. of observed cases	Average amount in liters	Average amount in c.c. and g.	
Wounding to admission	203	330	204	00	650	202	5	500
Admission to operation	204		204	33	640	204	130	950
Operation	207	7	20	6	500	207	6	800

PERCENTAGE OF PLASMA AND BLOOD ACCORDING TO

TABLE II.—MORTALITY DIVIDED ACCORDING TO INITIAL SYSTOLIC BLOOD PRESSURE ON ADMISSION TO FORWARD FIELD HOSPITAL

	Number cases observed	Deaths	Mortality rat (% of 204)
Admission systolic blood pressure over 90	78	4	5
Admission systolic blood pressure 80-90	9	7	78
Admission systolic blood pressure 70 or less	7	4	57
Admission systolic blood pressure not recorded	3	6	200
All cases	204	21	10

In instances systolic blood pressure 1 admission was not recorded but in none of the cases was the outcome fatal.

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TABLE III.—SYSTOLIC BLOOD PRESSURE AND PULSE RATE IN 31 FATALLY WOUNDED SOLDIERS

Time	Systolic blood pressure				Pulse rate			
	No. of observations	High	Low	Average	No. of observations	High	Low	Average
At admission	31	30		63.8	18	60	48	50
Before operation	31	140		68.2	29	70	56	58
At end of operation	23	38		67.5	25	66	50	50

The average time intervals for the group were from wounding to admission to forward field hospital 5 minutes; from admission to operation 87 minutes; from beginning to end of operation 149 minutes.

the duration of operation. As noted elsewhere there is good reason to believe that the major cause of the state of shock in such fresh casualties is blood loss (1, 2). As shown in Table I the wounds were recent at the time the casualties were admitted to the field hospitals for treatment, the average interval between wounding and admission being just under 6 hours. The gravity of the wounds is attested by the amounts of plasma and blood considered necessary in preparation for and in conduct of surgical operation. The men were for the most part previously healthy young soldiers, the average age being 24.6 years and the oldest being 42.

For the entire group of 204 casualties, there were 31 deaths during the forward observation

TABLE IV.—SYSTOLIC BLOOD PRESSURE AND PULSE RATE IN 204 CASES

Time	Systolic blood pressure		Pulse rate	
	No. of observations	Average value	No. of observations	Average value
At admission	208	83.6	130	70
Before operation	290	120.4	294	123.6
At end of operation	200	110.8	290	117.9

period. If the cases are divided according to initial systolic blood pressure readings at admission to hospital, as shown in Table II, it is seen that some correlation appears to exist between degree of hypotension and prognosis. Exceptions are fairly numerous, however. The mortality rate of 15.2 per cent for the entire group indicates the severity of the wounds under consideration.

The data of Tables III and IV bear on the question of the prognostic value of changes in systolic blood pressure and pulse rate in the wounded. It is seen that the average values for systolic blood pressure are consistently lower at the three points of observation in the fatal cases as compared with the entire group, and the average values for pulse rate consistently higher. However, as systolic blood pressure rises preoperatively under restorative therapy, so does pulse rate as portrayed in Chart 1. Systolic blood pressure and pulse

TABLE V.—CORRELATION OF SYSTOLIC BLOOD PRESSURE AND PULSE RATE AT DIFFERENT INTERVALS IN THE EARLY CARE OF GRAVELY WOUNDED SOLDIERS

	Observations at admission			Observations before operation			Observations at end of operation		
	Pulse rate			Pulse rate			Pulse rate		
	0-30	31-100	Over 100	0-30	31-100	Over 100	0-30	31-100	Over 100
Admission systolic blood pressure over 100 (16 cases)									
	2	29	11			40	3	18	34
Admission systolic blood pressure 51-100 (53 cases)			33		14	73		14	61
Admission systolic blood pressure 30-50 (7 cases)						14		4	20
Admission systolic blood pressure (< 30 cases)						9		4	5

The pulse rates are for the same group as classified according to admission blood pressure, followed throughout the periods of observation.

ate both show a decline during the period of surgical operation. A rising pulse rate under treatment for shock does not appear to have prognostic significance if average values are considered. Furthermore, as systolic blood pressure rises toward the normal pulse rate becomes increasingly abnormally rapid. Accordingly the value for systolic blood pressure in a given case would seem to be a much better index of the patient's condition than pulse rate.

The values for systolic blood pressure and pulse rate as classified for the entire group studied are shown in Table V as the basis for computing correlation between these two factors. The values are taken at three points of observation namely at admission to the hospital immediately before operation and immediately after operation. If coefficients of correlation between systolic blood pressure and pulse rate are computed by the product moment method using Pearson's formula, we find that

- 1 For admission observations $r_1 = -.36$ for 140 cases
- 2 For observations before operation $r_2 = -.21$ for 194 cases.
- 3 For observations at end of operation $r_3 = -.10$ for 189 cases.

If it is recalled that a value of 1.0 for r indicates perfect correlation and that a zero value indicates total lack of correlation it is clear that no significant correlation can be discerned between systolic blood pressure and pulse rate. Furthermore, the coefficient of correlation becomes progressively lower under treatment. In order to demonstrate that this decrement in the value of r represents a significant trend and is not merely a chance finding the critical ratios between r values are determined. It is found that

$$C.R. \text{ for } r_1 - r_2 = 2.2$$

$$C.R. \text{ for } r_1 - r_3 = 1.7$$

$$C.R. \text{ for } r_2 - r_3 = 3.8$$

A critical ratio of 3.0 or above is highly significant and the above values therefore support in substantial degree the conclusion that changes in systolic blood pressure and pulse rate in this study are quite poorly correlated.

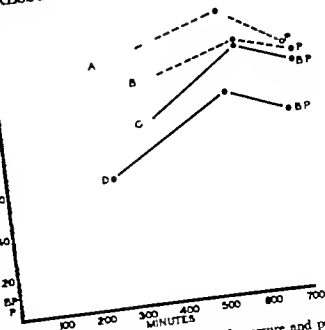


Chart 1. A study of systolic blood pressure and pulse rate in traumatic shock. A Pulse versus time after wounding in 31 fatal cases, B In 204 severely wounded cases, C Systolic blood pressure versus time after wounding in 204 severely wounded, D In 31 fatal cases.

SUMMARY

- 1 Values for systolic blood pressure and pulse rate in 204 freshly gravely wounded soldiers have been examined.
- 2 In nonfatal as well as fatal cases the systolic blood pressure under restorative therapy tended to rise toward normal whereas the pulse rate tended to rise away from normal.
- 3 Coefficients of correlation between systolic blood pressure and pulse rate are shown to be quite low both before and after restorative therapy and surgical operation.
- 4 Systolic blood pressure appeared to have more prognostic value than pulse rate though both showed more deviation from the normal in fatal cases than in the group as a whole.
- 5 Systolic blood pressure and pulse rate in traumatic shock should be considered as representing the momentary effect of varied and compounded physiological reactions. The frequency of exceptional values indicates that these two factors require caution in the evaluation of the state of traumatic shock.

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INDICATIONS FOR SIMPLE MASTECTOMY

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THE operation of simple mastectomy may be performed as a therapeutic or as a prophylactic procedure. It should not be utilized as a diagnostic method. Unfortunately these distinctions are not always clear in the minds of many surgeons, and considerable surgical abuse of the female mammary gland results. Lack of understanding of breast pathology and the physical harmlessness of even major breast surgery are factors contributing to the casual sacrifice of this organ. The mortality from breast surgery is practically nil and the physiological effects of removal of one or both mammary glands are likewise negligible considering modern pediatric facilities. Nevertheless, conservation of tissue, and avoidance of unnecessary destruction would seem to be fundamental surgical principles. Applied to surgery of the mammary gland such a principle is valid in itself aside from the important psychological and financial considerations incident to removal of a breast.

Bloodgood's succinct remark that a simple mastectomy is too radical a procedure for benign lesions and inadequate for malignant tumors is correct in principle but would seem to be too dogmatic a condemnation of this operation. In view of the confusion that seems to exist about the indications for this surgical procedure, we have reviewed the cases seen in the tumor clinic of the Research and Educational and the Presbyterian Hospitals in an attempt to clarify the rationale for performing a simple mastectomy. These patients are referred to the tumor clinic from the entire state and probably represent a fair cross-section of medical practice. Seventy-one such patients have been reviewed and are the basis of this report.

ANALYSIS OF CASES

I Simple mastectomies for diagnosed breast lesions 21

From the Department of Surgery of the University of Illinois College of Medicine, and the Tumor Clinics of the Research and Educational and the Presbyterian Hospitals.

a. Carcinoma	9
(Palliative 3)	
(Poor risk 6)	
b. Precancerous lesions	5
(Previously diagnosed by biopsy)	
c. Mastodynia	2
d. Papillary cystadenoma	1
e. Recurrent, multiple cysto-sarcoma phyllodes	
f. Multiple, persistent draining sinuses	1
g. Tuberculosis of breast	
h. Liposarcoma	1
II Simple mastectomies for lump in breast. Pathology	13
a. Carcinoma	13
(6 converted to radical)	
b. Chronic cystic mastitis	16
c. Papillary cystadenoma	2
d. Solitary cyst	1
e. Fat necrosis	1
III Simple mastectomies for bleeding nipple. Pathology	14
a. Chronic cystic mastitis	1
b. Intraductal papilloma	3
c. Carcinoma	1
IV Simple mastectomies for eczema of nipple. Pathology	2
a. Eczema	1
b. Paget's disease	1
V Simple mastectomies for clear discharge from nipple. Pathology	1
Chronic cystic mastitis	

Group I. Twenty-one patients of this group had simple mastectomies performed after a diagnosis had been established either by biopsy or clinical recognition of an obvious lesion.

a. Nine operations were done because of cancer 3 of which were deliberately palliative for lesions considered incurable. These were large ulcerated and fungating masses. The other 6 patients with cancer were such poor surgical risks due to age or cardiovascular disease or both that a radical mastectomy was deemed inadvisable. Aside from the increased surgical risk there is no point in trying for a five year cure in an elderly patient whose physical condition can only give a reasonable life expectancy of 2 to 3 years. This, of course

requires careful evaluation as one must not err on the side of conservatism in treating cancer.

b Five of the patients in group I had a simple mastectomy performed because of a previous biopsy diagnosis demonstrating a lesion considered to be 'pre-cancerous.' It is significant that in the total series of 71 cases, only 5 were considered to be precancerous. This is the most controversial question in breast pathology and will be discussed later.

c Two patients had simple mastectomy done because of such severe pain in one breast that they were literally in danger of becoming narcotic addicts. We have no explanation of this degree of mastodynia but it was not on a neurotic basis in these instances nor were they actual addicts, as both patients were completely relieved. Each had had one or more excisions of painful areas of chronic cystic mastitis before mastectomy and neither had been relieved by hormone therapy.

d This patient had multiple excisions of benign papillary cystadenomas and had multiple tumors when seen in the clinic. The other breast was unaffected. It was obvious that only a mastectomy here could obviate a potentially dangerous situation.

e This patient had multiple, recurrent miniature cystosarcoma phylloides and a mastectomy was the only recourse.

f and g These two groups are self-explanatory and comprise 2 patients in each of which the breast was irreparably damaged by abscesses and chronic draining sinuses.

h This patient had a bulky liposarcoma, diagnosed on biopsy and an extensive complete mastectomy was performed without removal of pectoral muscles or axillary contents.

Group II In this group there are 33 patients who had a simple mastectomy performed because of the presence of a mass in the breast. In some of these patients it is probable that the surgeon suspected carcinoma. None of these patients however were in too poor physical condition to tolerate a radical mastectomy nor were the cancerous lesions advanced when first operated upon.

a. Thirteen patients of this group had carcinoma of the breast and all but two had recurrences when seen in the clinic. These 2 and 4 others who were still operable were

reoperated upon and the surgical therapy converted to a radical mastectomy. The other 7 patients were candidates for palliative radiation only.

b Sixteen patients of this group showed only chronic cystic mastitis in the amputated breasts. The types of mastitis present were not considered significant or necessarily indicative of possible future trouble. Most of these patients were under the age of 40 years.

c, d and e The breasts of 2 patients showed benign papillary cystadenomas, one specimen showed only a solitary cyst of the 'blue-dome' type, and one showed only fat necrosis from a previous injury. This last diagnosis was suspected before operation but the surgeon did a simple mastectomy.

Group III Fourteen patients were subjected to simple mastectomy because of the history of bloody discharge from the nipple. Only one of these had a discrete mass in the breast. This was in a senile patient whose operation was performed under local anesthesia because of her poor physical condition. The mass was minute and pathologically was a low grade intraductal papillary carcinoma with beginning infiltration of the duct wall. Three cases of benign intraductal papillomas were found. None of these showed atypical cytological changes. Ten of the specimens showed only varying degrees of chronic cystic mastitis of no particular prognostic significance.

Group IV In this group 2 patients were subjected to simple mastectomy because of the presence of eczema of the nipple. The specimen from 1 patient, 31 years old showed only eczema. This same patient developed eczema of the remaining nipple several years later and this promptly subsided under dermatologic care. The other patient had true Paget's disease and in the amputated breast there was also a focus of infiltrating duct carcinoma which was palpable before surgery was performed.

Group V One patient is listed who had a simple mastectomy because of a clear discharge from the nipple. No discrete mass was palpable. The breast specimen showed only chronic cystic mastitis of no particular significance.

RESUME

From this review it would seem that in 71 instances of simple mastectomy only 21 were justified. These 21 cases were all direct attempts at eradication of a known disease and in each the diagnosis had been established either by biopsy or clinical recognition of an obvious lesion. These 21 cases comprised 9 of carcinoma, 5 diagnosed as precancerous lesions, 2 of uncontrollable mastodynia, and 1 each of recurrent and multiple papillary cystadenomas, multiple recurrent cystosarcoma phyllodes, tuberculosis of the breast liposarcoma of the breast and chronic draining sinuses of the breast with destruction of the gland.

Six of the patients treated for cancer were such poor surgical risks that only a simple mastectomy was considered justified. Two are untraced, 2 are dead of heart disease, and 2 are alive over 2 years without evidence of recurrence. The 3 patients treated by simple mastectomy as a palliative procedure had varying histories. One had recurrence in the scar in 3 weeks, 1 was dead in 3 months, and 1 is alive and well 8 years. This last is obviously a case of mistaken prognostic estimate as the microscopic sections have been reviewed and verified. Simple mastectomy is useful as a palliative operation to remove bulky ulcerated and fungating masses. Ordinarily x-ray treatment would be expected to follow such a procedure. In many such cases a radical mastectomy will give better palliation than a simple if the lesion is locally operable and axillary metastases are not fixed. The palliative value of a radical mastectomy has not been adequately appreciated or publicized. Actually most radical mastectomies are palliative, in the sense that less than half of all breast cancers so treated are cured although the operation originally was advised as a curative attempt.

The other cases considered to be valid indications for simple mastectomy are largely self-explanatory. The 5 patients who had simple amputation following microscopic diagnosis of a precancerous lesion had diffuse duct changes that were considered to be dangerous enough to warrant extirpation of the breast. Their number in this series is small, but their num-

ber is minute compared to the hundreds of patients having had radical mastectomy and patients having only local excision of benign lesions passing through the tumor clinic.

The 50 patients in this series whose simple mastectomies are considered to have been unnecessary are probably mainly overzealous attempts to be on the safe side. Simple excision of the mass, however, would have accomplished the same thing and in the cancer cases would have afforded less temptation to tamper with the disease. It would seem unnecessary to comment on the seriousness of the error in removing a breast of a younger woman for a benign lesion or equally the error of inadequate surgery for a malignant tumor.

It may be argued that the simple mastectomies done for chronic cystic mastitis were justified from the standpoint of prophylaxis of later cancer, yet the 26 cases listed in Groups II and III were not considered to show precancerous changes. Indications for simple mastectomy are fairly clear when a definite known disease entity is being treated, such as cancer in a poor risk patient, tuberculosis of the breast or cystosarcoma phyllodes. It should be equally clear that this surgical procedure should not be used for diagnostic purposes. The prophylactic aspect of prevention of breast cancer however is a very controversial subject.

The conflict lies, of course, in the definition of what is, and what is not a "pre-cancerous lesion." If we could be certain that a given breast lesion would inevitably become malignant the diagnosis of that lesion would constitute a clear indication for its excision. Theoretically that would not necessarily mean a simple mastectomy. However the only breast diseases that have been implicated in studies of this problem are diffuse changes that involve both breasts, and parts of each breast in varying degree. The conglomeration of pathological changes loosely grouped under the heading "chronic cystic mastitis" are the principal bone of contention in the arguments as to what represents a precancerous lesion. Three of the most intensive recent studies (2, 3, 5) of this problem present somewhat divergent points of view in their details, but

are in agreement on the general principle that more mammary cancer is found in women with chronic cystic mastitis than in females with normal breasts. Such statistical demonstration of relationship does not necessarily imply cause and effect. The pathological changes of chronic cystic mastitis may well be unrelated side-effects of a process which leads to cancer in certain vulnerable areas of epithelium. If the relationship between chronic cystic mastitis and cancer is merely one of association rather than that of stages in a continuous process, then the urgency to eradicate such tissue is less. The pathologic change that has been most closely linked to the development of infiltrating carcinoma is that of duct papillomatosis with cytologic atypism, as described by Foote and Stewart. When this lesion is encountered it may be considered a valid indication for prophylactic simple mastectomy after careful microscopic definition of the tissue. Such lesions shade so imperceptibly into carcinoma *in situ* and ordinary duct cancer that in many instances the differentiation cannot be made.

The problem is still the definition of a pre-cancerous lesion probably one component of the chronic cystic mastitis complex. The authors are in complete agreement with Campbell that the diagnosis of chronic cystic mastitis, the presence of a bleeding nipple, or of intraductal papillomas without cellular atypism do not indicate a prophylactic simple amputation especially in a young woman.

Before any discussion of the value of simple mastectomy it would be well to define this operation. It is usually considered to mean a complete unilateral extirpation of the mammary tissue including the nipple and areola, but without removal of the pectoral muscles or dissection of the axillary contents. Ordinarily a minimal amount of skin is excised.

Actually most simple mastectomies are only partial mastectomies as the breast parenchyma extends far more widely than is generally appreciated. Many so-called radical mastectomies do not remove the breast tissue completely even though the muscles and axillary contents are removed.

Hicken has shown that complete excision of mammary tissue is seldom accomplished in



Fig. 1. Photograph of recurrent, benign, intracystic papilloma occurring 5 years after "simple mastectomy" for similar lesion.

the usual simple mastectomy. His x-ray visualization of the lactiferous ducts has shown that in 95 per cent of the mammary glands studied ducts ascended into the axilla, and some even followed the brachial vessels into the axillary apex. Ducts were found to extend down and medially into the epigastric space in 15 per cent of the cases studied. The ducts also were frequently in intimate contact with the overlying skin and were, on occasions found to cross the midline, pass posterior to the latissimus dorsi muscle border and also penetrate into the substance of the pectoralis major muscle. This excellent study has made it apparent that the majority of our simple mastectomy operations represent only partial or incomplete mastectomies. This is well illustrated by one of our cases in which a mastectomy was performed for an intracystic papilloma. Five years later the patient had a recurrent intracystic papilloma on the same side (Fig. 1).

DISCUSSION

Review of patients having simple mastectomy shows that the operation is uncommonly indicated and is performed too frequently. It is our belief that this procedure should be performed only on the basis of a carefully defined diagnosis. In other words simple amputation of a breast should not be done on suspicion or just in case of doubt unless that doubt is communicated to the patient and

she makes the decision as to acceptance of the risk or elimination by mastectomy. These doubtful situations may be narrowed down considerably by recognition that the only accepted precancerous breast lesions are those duct changes exhibiting atypical hyperplasia to a degree requiring serious consideration of the diagnosis of cancer. Functional changes to a lesser degree or in a different direction can be safely followed without mastectomy by rigid periodic checkups.

Simple mastectomy in other situations would seem to have fairly definite indications. The presence of early cancer in a very poor risk patient is considered to be a worthwhile reason for simple mastectomy. Tuberculosis of the breast with extensive and deep involvement is another recurrent cysto-sarcoma phyllodes or giant intracanalicular adenomyxoma with atypical spindle cell stroma is equally an indication for mastectomy. Occasionally fat necrosis involves the entire breast tissue with sinus formation, local excision of such lesions is impracticable and in fact impossible. Mastodynia of a very severe degree may rarely indicate removal of a breast. Endocrine therapy can relieve, or ameliorate to a bearable degree most of these situations. We believe that simple mastectomy has a very definite but limited place in palliative treatment of advanced breast cancer. Bulky ulcerated masses should be removed but if the axillary involvement is operable and the patient in adequate physical condition a radical mastectomy possibly with skin graft is preferable. Radiation should always be used in palliative problems.

SUMMARY AND CONCLUSIONS

The operation of simple mastectomy is performed far too frequently for benign breast lesions. The usual operation of this type is inadequate and does not remove completely

the breast tissue. Such limited surgery is useful but not when a diffuse lesion of the breast is being treated and particularly not when the operation is done for a "precancerous" lesion as prophylaxis against cancer. Such prophylactic amputation of a breast should be done only on very well considered biopsy material which is interpreted as showing diffuse duct epithelial changes of atypical hyperplasia of a marked degree. We consider the indications for simple mastectomy to be as follows:

1. Therapeutic, when a diagnosed disease of the breast is being treated.
 - a. Palliative for advanced, inoperable breast cancer with a bulky ulcerating mass.
 - b. Palliative for cancer in poor risk patients.
 - c. Sarcoma of the breast.
 - d. Chronic suppurative infections of the breast either non specific or tuberculous, which have destroyed much breast tissue.
 - e. The rare case of uncontrollable and severe mastodynia which does not respond to endocrine therapy and which requires opiates for relief.
 - f. The rare case of diffuse fat necrosis throughout the breast, with sinus formation.
2. Prophylactic.
 - a. Multiple or diffuse, and recurrent benign tumors with malignant potentials such as multiple intracystic papillomas, and cysto-sarcoma phyllodes.
 - b. Precancerous chronic cystic mastitis, showing diffuse duct changes of advanced atypical epithelial hyperplasia.

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TRANSABDOMINAL GASTRIC VAGOTOMY

A Study of the Anatomy and Surgery of the Vagus Nerves at the Lower Portion of the Esophagus

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A LARGE variety of surgical procedures for the treatment of peptic ulcer have been introduced since Billroth first devised his epoch making operations on the stomach. With the advent of each new operation fresh impetus has been supplied to a study of the anatomy of the organs and structures involved in the newer techniques. The recent introduction by Dragstedt and his associates (1-5) of complete division of the vagus nerve supply to the stomach as a method of treatment for peptic ulcer has focused the attention of the surgeon and the anatomist alike on the finer anatomy of the vagus nerves and the variations in the distribution of these structures at the lower portion of the esophagus. At the University of Chicago Clinics approximately 300 of these operations have been performed to the present time. The clinical results have been so satisfactory and the complications so transitory and inconsequential that this method has very largely replaced all other types of surgical treatment for this disease in this Clinic. As experience has accumulated the necessity for complete division of the vagus supply to the stomach has become more evident. Physiological tests on 170 patients on whom the operation was performed by us have revealed that the vagus section was probably incomplete in 18 cases. In this group 6 patients have complained of recurrent or persistent ulcer symptoms and in 2 of these, an undamaged vagus fiber was found at a second

operation. Division of this nerve was followed by complete relief. The remaining 164 patients have remained free from all types of ulcer distress on an entirely unrestricted diet and without medication. In general a complete vagotomy is manifested by a profound decrease in the volume and acidity of the continuous night secretion and a negative gastric secretory response to insulin hypoglycemia and the sham meal. It is a striking fact that the excessive continuous night secretion of gastric juice characteristic of patients with duodenal ulcer may be unaffected by the section of two large vagus trunks if a single small vagus fiber is left undisturbed. Section of this remaining fiber may then produce the profound decrease in gastric secretion characteristic of total vagotomy.

The present paper represents the outcome of a co-operative effort carried on in the department of anatomy at the University of Illinois under the direction of Dr. O. Kampmeier and in the department of surgery at the University of Chicago. In the anatomical laboratory a careful dissection was made of the vagus nerves along the lower esophagus in 60 cadavers. Careful records and drawings were made of the variations encountered in the distribution and branches of the right and left vagus nerves along the lower 3 inches of the esophagus and these have been summarized in Figure 1. It is important to note in this drawing that in 81 per cent of cases, the distribution of the anterior and posterior vagus trunks is as illustrated in Figure 1a and Figure 2. Commoner variations are depicted in Figures 1b, 1c, 1d, 1e, 1f, 1g and 1h.

In the laboratories of the department of surgery specimens of the esophagus and stom-

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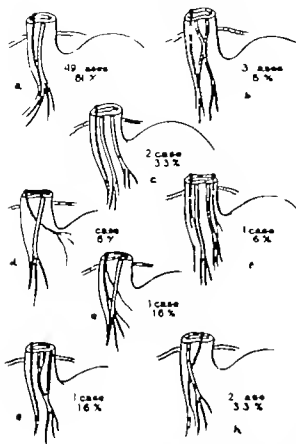


Fig. 1. Sketches showing the distribution of the vagus nerves along the lower portion of the esophagus and upper stomach in 10 human dissection specimens. Note that in 68 per cent of the cases, the distribution is as illustrated in a.

ach were obtained at autopsy from 18 bodies, the vagus nerves carefully dissected and after the dissection the specimens were inflated with air and permitted to dry slowly. The vagus nerves were then colored with white ink to make them stand out sharply in the photographs (Figures 3-12). It is probable that a better understanding of the vagus nerve supply to the stomach can be secured from inspection of the drawings and photographs than could be provided by textual description.

The studies referred to above have been correlated with the less exact observations made at the operating table during the course of division of the vagus nerves to the stomach either by the transthoracic or by the transabdominal approach. In the series of 170 patients in which reliable physiological evidence concerning the completeness of the vagus sec-

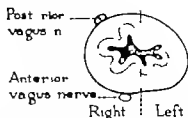


Fig. 2. A drawing of a transverse section of the esophagus just below the diaphragm showing the most frequent position of the posterior and of the anterior vagus nerve. Note that both nerve trunks are on the right of the esophagus.

tion is available the operation was performed by the transthoracic approach in 61 patients and by the transabdominal route in 109 patients. Analysis of these data indicates that we were just as successful in securing a complete vagotomy by the transabdominal operation as by exposure of the esophagus in the chest. A careful consideration of the technique employed in the transabdominal operation is however very necessary because it seems very likely that the abdominal methods described by Stierlin, Schlösser, and others would very rarely if ever yield a complete division of the vagus fibers to the stomach. It should be emphasized that in both the transthoracic and in the transabdominal operation, the vagus nerves are divided at a point 2½ to 3 inches above the junction of the esophagus with the stomach. Regardless of the type of approach the operation is a supradiaphragmatic section of the vagus nerves.

A midline incision is made from the xiphoid cartilage to a point 2 or 3 centimeters below the umbilicus. An exploration of the abdomen is then made with especial care to determine the nature and extent of pathology in the stomach and duodenum. If the ulcer is in the duodenum it is important to determine the presence or absence of cicatricial obstruction at the pylorus. Helpful information can be secured by palpation or by the passage of the Levine tube, which is present in the stomach through the pyloric sphincter. If cicatricial obstruction at the pylorus is found the vagus section should be combined with a gastroenterostomy or a gastroduodenostomy. The vagus section is best performed first. While the surgeon makes gentle downward traction on the left lobe of the liver his assistant divides

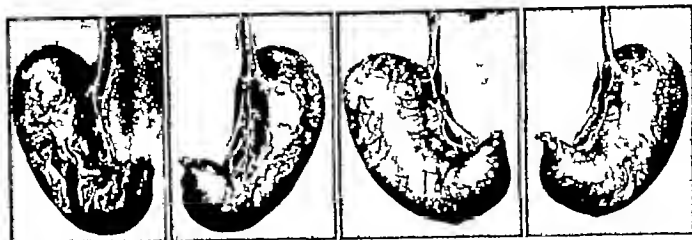


Fig. 3

Fig. 4



Fig. 5

Fig. 6

Figs. 3-12 Photographs showing the distribution of the vagus nerves to the esophagus and stomach in man. The vagus nerves have been dissected out, colored with white ink, and the stomachs inflated with air before the photo-

graphs were taken. Note that both vagus nerves terminate along the lesser curvature of the stomach, that there are frequent anastomosing branches between them but no true plexus formation.

the triangular ligament with scissors until the lower esophagus is uncovered. The left lobe of the liver is then retracted firmly to the right with a cloth-covered spring retractor. The tube in the stomach facilitates palpation of the lower portion of the esophagus. The peritoneum overlying the esophagus at the margin of the diaphragm is secured with forceps and incised. The scissors are then thrust upward into the mediastinum over the esophagus and the opening enlarged. The index finger is introduced through this opening into the mediastinum and the esophagus mobilized by careful finger dissection. It is important to exercise great care in this dissection since at

least one case has been reported in which the esophagus has been opened. During mobilization of the esophagus in this procedure it is important not to dislocate the vagus trunks by inserting the finger between the nerves and the esophageal wall. If care is taken the nerves as well as the esophagus can be encompassed by the index finger and pulled downward into the abdomen. The vagus trunks are appreciated by palpation as firm, unyielding cords against the more elastic esophageal musculature. The right or posterior trunk is separated from the esophagus with the fingers and pulled around to the left or splenic side of the esophagus. It is usually possible to get

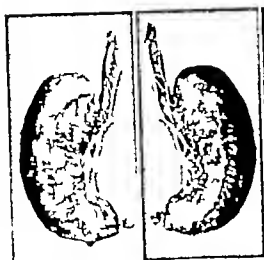


Fig. 7



Fig. 8.

two or three fingers under the nerve trunk in this maneuver thus exposing from $2\frac{1}{2}$ to 3 inches of the nerve. It is our practice to secure this nerve as high as possible with a hemostatic forceps and apply a ligature of nonabsorbable suture material either silk or linen above the hemostat. The nerve is then divided and the distal end pulled downward on the stomach. It is usually possible to excise 2 inches of the trunk for microscopic examination and also as a preventive against subsequent regeneration. The anterior vagus nerve is then separated from the esophagus by a similar maneuver ligated and a portion excised. The longitudinal musculature of the esophagus will now be found to relax somewhat, permitting the esophagus to be pulled still farther into the abdominal cavity. This makes possible the careful inspection of the lower 3 inches of the esophagus, and it is wise at this stage to pick off all strands of fascia and possible nerve fibers with a pair of forceps. In rare cases, a branch of the vagus nerve, either anterior or posterior may be found incorporated in the esophageal musculature or immediately superficial to the mucous membrane. Such branches are readily missed and can be detected only by careful palpation after tension is exerted on the esophagus in several directions. When satisfied that the vagotomy is complete and that hemostasis has been secured the operator closes the opening into the mediastinum with three or four interrupted catgut sutures. The left lobe of

the liver is now replaced but it is usually unnecessary to suture the triangular ligament. If cicatricial obstruction of the pylorus has been found a gastroenterostomy or gastroduodenostomy should now be performed.

POSTOPERATIVE MANAGEMENT

The postoperative care of patients upon whom a total gastric vagotomy has been performed is most important. It is probable that most of the motor disturbances in the stomach that have been encountered are due to failure to appreciate this fact. The mammalian stomach like the heart and the amphibian lung possesses a true peripheral automatism which makes it possible to display its characteristic motor function in the absence of all nervous connections with the central nervous system or even if entirely removed from the body. It is well known that strips of stomach or intestine suspended in oxygenated baths of Ringer's solution or Locke's solution will contract rhythmically for many hours and in response to various types of stimulation. While this is true, under normal conditions, the stomach *in situ* is influenced by two sets of extrinsic nerves the vagi and the sympathetics. These two systems are in constant, but varying tonic activity. While both motor and inhibitory fibers have been demonstrated in the vagus nerves, it is probable that in man, as in the cat and dog, the predominant effect of the vagus on the motility of the cardia is inhibitory. It is motor or augmentor to the

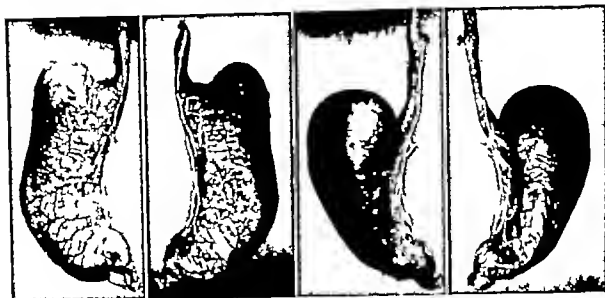


Fig. 9.

Fig. 10.



Fig. 11.

Fig. 12.

antrum and body of the stomach and inhibitory to the pylorus. In general the influence of the sympathetic nerves is antagonistic to that of the vagus. When the vagus effect is then suddenly removed the peripheral motor mechanism of the stomach is subjected only to the activity of the sympathetic nerves and to those humoral influences which come to the stomach by way of the blood stream. If the vagus nerves in the dog are divided high in the chest a marked increase in the tonic activity of the cardia and pylorus is produced which in some cases amounts to a true cardiospasm and pylorospasm. On the other hand the tonus and motility of the body and antrum of the stomach is markedly reduced. Although

we have carefully watched for this complication we have not yet seen a comparable cardiospasm in man following vagotomy from 2 to 3 inches above the stomach. It is possible, however, that vagotomy at a higher level might produce this complication.

It is difficult to determine the presence of pylorospasm in human patients and especially when an ulcer is present in the duodenum. Obstruction at the pylorus could be due to the unopposed motor action of the sympathetic nerves to local spasm or edema or to actual scar tissue narrowing. It is our impression that a pylorospasm comparable to that seen in many dogs following high vagotomy is not commonly seen in the human patient. The

unopposed inhibitory effect of the sympathetic nerves on the tonus and motility of the body of the stomach however makes it easy to produce a marked dilatation and distention of this part of the organ. In the immediate postoperative period this dilatation and distention are most commonly due to the accumulation of swallowed air and gastric and intestinal secretion. Occasionally it may be due to the overingestion of food and drink. Overdistention and dilatation of the stomach markedly delay and interfere with the readjustment of the peripheral motor mechanism and may make the postoperative care of these patients very difficult. If this overdistention of the stomach is prevented a readjustment in the peripheral motor mechanism takes place so that in a relatively short period of time the motor function of the stomach resembles that seen in normal individuals. It is probable that the hypermotility which characterizes many of these patients before vagotomy is never regained. The mechanism of this readjustment after vagotomy is not known. Presumably it might be due to a gradual decrease in the tonic influence of the sympathetic nerves or to an increased activity and influence of the local nerve plexus of Auerbach. While a varying length of time is required by different patients for the peripheral readjustment of the gastric motor mechanism in our experience, the following management has usually been successful.

A Levine tube is introduced through the nose into the stomach from 24 to 48 hours before the operation and the stomach is decompressed by the Wangenstein apparatus. The tube is left in place for 4 or 5 days following the vagus section and great care is observed during this period to make sure that the stomach is completely decompressed. A marked reduction in the volume and acidity of the gastric secretion removed from the stomach after operation as compared with the amount

secured in a comparable period before is a good index of the completeness of the vagotomy. When the tube is removed on the fourth or fifth day the patient is permitted to take 30 cubic centimeters of water per hour for the first day. At the end of the day the stomach is aspirated and if it is empty 60 cubic centimeters of water per hour is permitted for the following day. If aspiration reveals that the larger amount has left the stomach, the patient is placed on a clear liquid diet for 2 or 3 days. The patient is instructed to cease eating if he feels distended. If the liquid diet leaves the stomach satisfactorily semisolid food in small amounts is gradually added. The patient is instructed concerning the alterations in the physiology of the stomach that result from the operation and his co-operation is sought in preventing overdistention in the immediate postoperative period. Some patients have returned to a full diet within 2 to 3 weeks without ill effects, while others more cautious, have voluntarily restricted the intake of food for 5 or 6 weeks. If the stomach has not become overdistended in the immediate postoperative period it is likely that most patients regain normal motor function within 6 months. It is well to bear in mind however that a large ulcer crater in the duodenum may produce cicatricial obstruction on healing that was not observed at the time of the operation. While it is true that urecholine in suitable doses increases the motor activity of the vagotomized human stomach we have not found it necessary or advisable to use this drug in the routine postoperative care of these patients.

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MEDIASTINAL CYSTS AND TUMORS

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OVER 12 years ago George J. Heuer (26, 28) stated: "The subject of intrathoracic tumors has already become so large that it is difficult to deal with it in a short paper." What he said then of intrathoracic tumors is now true of mediastinal tumors. However, because of the difficulties attendant on diagnosis of mediastinal tumors and the vital necessity of keeping all tumors in mind in differential diagnosis of individual cases, it is well to publish occasional summaries to view more clearly the whole subject. All too often papers are published on benign intrathoracic or mediastinal neoplasms without emphasizing, as John Alexander (5, 6) does, that "The majority of circumscribed intrathoracic neoplasms arise within the lung (almost all of them being malignant); many of those that arise outside the lung are malignant, and therefore the prompt removal of any circumscribed neoplasm which cannot be proved benign is of vital importance."

An adequate classification of mediastinal tumors can be obtained by combining the classifications which were used by Carlson, Laipply, and Heuer (25) in the following manner:

- | | |
|---|---------------------------------|
| I. Congenital cysts | |
| 1. Epidermoid cysts | Ectoderm |
| 2. Dermoid cysts | Ectoderm and mesoderm |
| 3. Teratomas | Ectoderm, endoderm and mesoderm |
| 4. Pericardial celomic cysts | Mesoderm |
| 5. Bronchial cysts | Endoderm and mesoderm |
| 6. Esophageal cyst | Endoderm and mesoderm |
| 7. Gastroenteric cyst | |
| a. Gastric | Endoderm and mesoderm |
| b. Enteric | Endoderm and mesoderm |
| 8. Cystic lymphangioma | Mesoderm |
| II. Acquired cysts | |
| Parasitic cyst, caused by <i>Taenia echinococcus</i> | |
| Neoplastic cyst, due to degeneration of a solid tumor | |
| 3. Cystic hematoma, resulting from degeneration of hematoma | |

From the Surgical and Laboratory Services of Fitzsimons General Hospital, Denver, Colorado

III. Connective tissue tumors

1. Fibromas
2. Lipomas
3. Leiomyomas
4. Xanthomas
5. Chondromas
6. Chondromyxomas
7. Chondromyxosarcomas

IV. Neurogenic tumors

1. Neurofibromas
2. Gangliogliomas
3. Neuroblastomas
4. Neuroepitheliomas

V. Primary tumors of thymus

1. Benign thymomas
2. Malignant thymomas
3. Thymic cysts

VI. Primary tumors of lymph nodes

1. Lymphosarcomas
2. Hodgkin's disease
3. Boeck's sarcoid (?)
4. Endotheliomas

VII. Primary and secondary sarcomas

VIII. Primary and secondary carcinomas

IX. Intrathoracic goiters

A discussion of the symptomatology of such a large group of tumors is virtually impossible, as the individual cases vary from the asymptomatic (by far the largest group) to expectoration of tumor contents and obstructive symptoms causing death. All of the classical symptoms of chest pathology may be present in individual cases, or which is more usual none. The physical examinations too are extremely variable, depending on the size, location, consistency, presence or absence of infection, and extent of involvement of adjacent structures. Roentgenograms are an invaluable aid in this field where physical findings are all too frequently minimal or completely absent. Heuer and Andrus, in their excellent monograph (27) on "The Surgery of Mediastinal Tumors," repeatedly emphasize that surgery is indicated in all mediastinal tumors, not only for treatment but as the only means of positive diagnosis in most cases.

CONGENITAL CYSTS

Epidermoid cysts, dermoid cysts, and teratomas. The first three types of congenital cysts are grouped as one when discussing



Fig. 1

Fig. 2

Fig. 3

Fig. 4

Fig. 1. Preoperative roentgenogram. Area of density right mediastinum.

Fig. 2. Gross specimen.

Fig. 3. Cyst lined by squamous epithelium. Thick lymphoid tissue in all.

Fig. 4. Postoperative roentgenogram.

their origin. Two plausible hypotheses have been advanced to explain pathogenesis of these tumors, the monogerminal and the bigerminal. Rusby adequately reviews the evolution of these theories and thinks the monogerminal theory is the more reasonable, that the explanation lies in an abnormality of the third and fourth branchial arches, with the abnormal cells being carried into the thorax by the normal descent of the heart and great vessels. He is careful to state that the problem is not yet solved.

Since the original report by Gordon in 1823 to the present time there have been many reviews of this subject in the literature notably Hare (1889) Dangschat (1903) Hertzler (1916) Heuer (1926) Hedblom (1933) and Rusby (1944). In 1945 Lalpally totaled the cases of epidermoids, dermoids, and teratomas at 245 adding a dermoid of his own.

The importance of these tumors lies in the facts that (1) They may cause pressure symptoms as they increase in size. (2) They may become secondarily infected. (3) They may rupture into a bronchus, a blood vessel or the pleura. (4) They may degenerate to malignancy. For these reasons plus the fact that positive diagnosis is impossible in most cases all writers agree that surgical excision is the treatment of choice.

The differentiation between epidermoid, dermoid and teratoma can usually be made grossly if the cyst contents are well defined with adult structures present particularly in the first two; however the microscopic picture will frequently cause the gross diagnosis to be

changed. Epidermoid is the simplest of the cysts lined by stratified squamous epithelium supported by fibrous tissue and its contents are desquamated and degenerated epithelial cells. Dermoid cysts are lined by stratified squamous epithelium with added elements in their walls of structures ordinarily arising from skin: sebaceous glands, coil glands, hair and teeth. The teratomas include elements of all three layers so that all structures of the epidermoid or dermoid may be present plus ciliated and cylindrical cell structures of gut or respiratory tract origin, muscle, bone, cartilage, lymphoid tissue, brain and thyroid.

We offer four cases in this group: 1 dermoid and 3 teratomas.

CASE 1: J. E. H., 23 year old white male, had a routine chest roentgenogram which demonstrated mediastinal tumor. Patient was completely asymptomatic. Physical examination was negative except for slight dullness to percussion and diminution of breath sounds in the anterior right chest extending from the right border of cardiac dullness to the nipple line. Laboratory studies were negative. Roentgenograms showed a circumscribed area of density in the anterior right mediastinum. Fluoroscopy showed no evidence of communication with the vascular system. Thoracotomy and removal of a dermoid cyst in the anterior mediastinum was performed November 9, 1945. Patient was returned to the ward in good condition, and postoperative course was uneventful. Pathological examination of the wall showed a cyst measuring 11 by 10 by 8 centimeters in size from which on cutting a large quantity of yellow turbid material escaped under pressure. There were numerous strands of basophilic squamous epithelium, but no hair as noted. Cyst wall was lined by a flat layer of squamous epithelium and clinging to the surface were numerous lamellations of desquamated squamous epithelium.



Fig. 5



Fig. 6



Fig. 7



Fig. 8

Fig. 5 Preoperative roentgenogram. Case 3. Tumor of superior mediastinum.
Fig. 6 Gross specimen.

Fig. 7 Microscopic section showing tubular structures.
Fig. 8. Postoperative roentgenogram showing metastases.

Diagnosis cyst, dermoid thoracic mediastinal right (Figs 1 to 4.)

CASE 3. G. W. A., 30 year old white male, had a routine chest plate which showed an anterior mediastinal tumor. Patient was asymptomatic. Physical examination was negative. Laboratory studies were within normal limits except for the roentgenogram which showed a large mediastinal tumor extending into the right pleural cavity. Fluoroscopy showed no evidence of connection with the vascular system. Exploratory thoracotomy showed a large mediastinal tumor on the right which was removed without difficulty. Patient was returned to the ward in good condition and postoperative course was uneventful. Pathological report showed a 13 by 9 by 8 centimeter cystic mass which on cut section showed

lustrous material with about 490 brown watery fluid in the center howed a dermoid ridge contain

an occasional apocrine present

on of aug

c

in the skull, dorsal spine, lumbar spine or pelvis. There was a circumscribed area of increased density at the neck of the right femur but not suggestive of metastasis, probably normal variation in bone density. Two months after onset of his symptoms he developed malaise, fever, sweats, productive cough with blood tinged sputum and the diagnosis of pneumonia. He recovered from these symptoms following sulfathiazole therapy then he was treated with an unknown amount of deep x ray radiation and the diagnosis of lymphoma, superior mediastinum was made. Following this treatment patient was discharged to return in 6 months for a check up. On return after a 6 months period there was a noticeable enlargement of the tumor mass, and he was transferred to this hospital for further study. On admission to this hospital his only complaint was exertional dyspnea. He had no cough, sputum, hemoptysis or weight loss. Physical examination was essentially negative. Laboratory studies were within normal limits except for the roentgenograms of the chest which showed a circumscribed sharply demarcated tumor in the posterior superior mediastinum extending to the right of the midline pushing the esophagus 2 centimeters to the left of the midline. There was no pulsation of the tumor. Mediastinotomy was performed through a necklace incision the tumor was palpated posterior to the trachea largely to the right. Blunt dissection exposed the tumor its upper cone-shaped wall was free with no thyroid connection. The tumor was removed

It was not attached to any organ, and completely encapsulated. Small cystic areas seen in the cut surface. Immediate recovery operation was uneventful. Two weeks follow

an 8 centimeter mass was felt in the left quadrant medial to spleen. Three weeks later both lung fields contained numerous shadows of homogeneous density $1\frac{1}{2}$ centimeter size diagnosed as metastases. X ray started immediately and the patient total of 900 roentgens through each of four



Fig. 9.

Fig. 10.

Fig. 11.

Fig. 12.

Fig. 9. Preoperative roentgenogram. Case 4. Left anterior mediastinal tumor.

Fig. 10. Gross specimen.

Fig. 11. Showing ciliated epithelium with goblet cells lining cystic spaces of cystic teratoma.

Fig. 12. First week postoperative roentgenogram.

portals during the next month. His progress was steadily downhill and he expired 3 months following surgery. Pathological report showed that the tumor appeared to be a solid teratomatous tumor (mixed tumor) of mediastinum. Areas in it were so cellular as to suggest bone carcinoma and sarcoma depending on the area observed and the cell type that had proliferated. Mitosis were occasionally seen. They seemed confined to the connective tissue cell. Diagnosis: teratoma, tumor of the mediastinum, malignant (Figs. 5 to 8).

CASE 4. J. P. O. M. 32 year old white male was well until 8 months previous to admission when he noticed a dull ache in the left shoulder which gradually became worse until it kept him awake at night. His symptoms were never severe enough to require hospitalization or examination by a physician. While at a separation center a routine roentgenogram showed a mass in the left upper mediastinum. Physical examination showed a visible and palpable pulsation synchronous with systole in the second left interspace. The mediastinum was widened to percussion in this area. Fluoroscopy showed a nonexpansive, left anterior mediastinal tumor with some plaque like calcification in the lateral wall. Esophagus was negative. Exploratory thoracotomy showed a large mediastinal teratoma located in the left anterior mediastinum extending upward into the root of the neck. The mass was completely removed. Patient returned to the ward in good condition. Postoperative course was uneventful. Pathological examination of tissue showed a fragmented cystic structure weighing 133 grams with irregularly sized, round to oval pedunculated tissue masses covered with pale squamous epithelium from which numerous pale hairs protruded. The cyst wall was flattened and covered with sebaceous material. Grossly no bone teeth or definitely teratomatous tissues were encountered. Microscopic section showed the lining of the cavity composed of a layer of squamous epithelium varying slightly in width. There were acini of mucous glands closely resembling those seen in the bronchus. In other areas, tubules lined by tall

columnar ciliated cells were seen with occasional goblet cells in the wall. There are bundles of smooth muscles associated with these tubules and occasional glandular structures. One small amorphous of calcified material was seen which may have been bone. Diagnosis: teratoma, cystic, mediastinal, benign, dermoid features predominating (Figs. 9 to 12).

Pericardial celomic cysts. The thin-walled cysts of the mediastinum have caused some discussion since Churchill described the findings at operation in Cabot's Case 23492. He did not mention the term "spring water" cysts at that time, but the name is now attributed to him. Mallory gave the pathological report on the same case, describing the cyst lining as "mesothelium" with the cells ordinarily so thin that they can hardly be distinguished from endothelium, but they occasionally thicken up to a cuboidal type of cell that looks quite like epithelium.

Lambert seems to have adequately explained the origin of these cysts in his theory of failure of one of the primitive pericardial lacunae to merge with the others, thereby forming a cyst. If we can combine the "spring water" cysts and the "pericardial celomic" cysts reported (Dufour H. and Nourret, 1939; Pickhardt O. C. 1934; Churchill, E. D. 1937; Lambert A. V. S. 1940; Greenfield L. et al. 1943) there are only 7 that meet the requirements of (1) a thin walled cyst, (2) clear fluid, (3) a lining membrane of endothelium or mesothelium that may look quite like epithelium. Seven seems entirely too few cases to be reported as we have 8 that meet the



FIG. 13.



FIG. 14.



FIG. 15.



FIG. 16.

Fig. 13. Preoperative roentgenogram (Case 12). Soft tissue mass in anterior right thorax.

Fig. 14. Preoperative bronchogram.

Fig. 15. Gross specimen.

Fig. 16. Showing simple fibrous wall with surrounding fat. 1. Epithelium is denuded.

above aorta. Possibly when the present confusion regarding classification is settled more cases will be reported.

CASE 5. I. H. B., 30 year old white male noted a sensation of pressure and fullness in the epigastric region 2 months previous to admission. There was very slight dyspnea on exertion otherwise asymptomatic. Physical examination was negative. Laboratory studies were negative except for the chest roentgenogram which showed a well circumscribed opacity at the cardiophrenic angle on the right. Exploratory thoracotomy showed a cystic lesion attached by a pedicle to the pericardial phrenic angle and it was easily removed. Recovery from operation was uneventful. Pathological report showed a cystic lesion measuring 8.5 by 5.5 by 7 centimeters in diameter with absolutely clear fluid and a very thin wall so that newsprint could be read through the specimen. Microscopic section showed the inner surface lined with flat epithelium and an occasional area composed of a few cuboidal cells. The cells rested on a hyaline membrane varying slightly in thickness and appearing to be composed of connective tissue. No squamous epithelial structures were noted in the wall and there was no ciliated epithelium. Diagnosis: cyst simple, pericardial (celomic) mediastinum right.

CASE 6. T. C. K., a 45 year old white male who complained of pain in the left chest, dyspnea, malaise and productive cough of 4 months duration. There was a weight loss of 12 pounds in the past 2 months. Physical examination was essentially negative. Laboratory tests were negative except for roentgenogram of the chest which showed a well circumscribed dense mass in the left lower lung field. Exploratory thoracotomy showed a large cyst occupying the angle between the diaphragm and the pericardium with a broad attachment to the pericardium. The cyst was dissected free and removed by blunt and sharp dissection. Recovery from the operation was uneventful. Pathological report

showed a cyst with no epithelial lining. The walls were composed of acellular fibrous lamellae with some hyalinization and in one section granular calcium disposition in a small area of degeneration of fibrous tissue. A serous layer covered the outer surface apparently pleura. Diagnosis: cyst serous unilateral intrathoracic left.

CASE 7. O. F. K., a 32 year old white male had a routine chest plate which showed an opacity in the medial and anterior portion of the right chest contiguous with the diaphragm. History and physical examination were completely negative. Laboratory tests were completely negative except for the roentgenogram which showed a well demarcated elliptical soft tissue mass in the right cardiophrenic area anteriorly. Gastrointestinal series was negative. Thoracotomy showed a clear thin walled cyst containing approximately 100 cubic centimeters of clear fluid freely movable and attached by a pedicle to the cardiophrenic angle. The cyst was removed, the patient returned to the ward in good condition and recovery was uneventful. Pathological report showed the cyst containing crystal clear fluid and newsprint was easily read through the cyst. Microscopic section of the cyst wall was thin and composed of parallel hyaline connective tissue fibers. Lining cells were flattened and no evidence of cilia was seen. Diagnosis: cyst spring water (celomic) mediastinum right.

CASE 8. R. S. S. This 27 year old white male had a routine roentgenogram of the chest which showed evidence of mediastinal tumor. History was completely negative. Physical examination showed a slight limitation of motion of the right chest with a flat percussion note in the lateral aspect of the right base. Breath sounds were diminished in this area, and tactile fremitus was decreased. The rest of the physical examination was normal. Laboratory examinations were within normal limits except for the roentgenogram which showed a well circumscribed density between the right middle and lower lobes. These findings were suggestive of a benign, cystic,



Fig. 7



Fig. 8

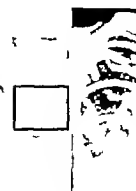


Fig. 9



Fig. 10

Fig. 7. Preoperative roentgenogram (Case 4)

Fig. 8. Opened gross specimen

Fig. 9. Showing ciliated columnar epithelium

Fig. 10. Postoperative roentgenogram.

tumor thought to be attached to the diaphragm or the pericardium. Thoracotomy showed a cyst attached to the cardiophrenic angle by a 2 inch pedicle. The cyst was easily removed. The thorax was closed. Patient returned to the ward in good condition. Recovery was uneventful. Pathological report showed a clear cyst about 8 centimeters in diameter with a thin wall composed of connective tissue with flat epithelium without cilia lining the cyst. Diagnosis: cyst pericardial, (celomic) mediastinum, right.

CASE 9. R. R. DIF. This 31 year old white male complained of vague pains in the epigastrium and upper left quadrant of the abdomen when he ate meat or became nervous. The pains were more severe when the patient was lying down. Duration of symptoms was unknown. Physical examination was negative except for decreased excursion of the left diaphragm which seemed high and immobile. Laboratory examinations were within normal limits with the exception of roentgenograms which revealed an abnormal mass in the left chest which was thought to be a diaphragmatic hernia. Diagnostic studies ruled out a diaphragmatic hernia, and the mass was thought to be primary in the left thorax. Thoracotomy was performed, and a cyst was removed. Pathological report showed a roughly pyramidal cyst measuring 11 by 7 by 7 centimeters with a clear thin wall. Approximately 250 cubic centimeters of thin crystal-colored fluid was evacuated from the cyst. Sections of the cyst wall showed the wall to be composed of laminated connective tissue, the lining of ciliated epithelium. The impression of the pathologist was that this was a mediastinal cyst which has been designated under numerous terms such as cystic lymphangioma, cystic hygroma, ciliated epithelial cyst or spring water cyst of Churchill. Pathological diagnosis: cyst mediastinal probably spring water.

CASE 10. P. B. This 29 year old colored male was completely asymptomatic but was told he had a chest tumor following a routine roentgenogram. Physical examination was essentially negative. Routine laboratory examinations were within normal limits. Roent-

genogram of the chest showed an opaque triangular density in the region of the middle lobe on the right. **Impressions.** Pericardial cyst. Bronchoscopy showed no evidence of endobronchial pathology. On September 5, 1946 right thoracotomy showed a pericardial cysts attached to the anterior cardiophrenic angle, this was easily removed intact. Postoperative course was entirely uneventful. Patient was returned to full duty. Pathological examination showed a pear-shaped fluid-filled cyst weighing 210 grams containing 180 cubic centimeters of crystal clear watery fluid, specific gravity 1.009. Cyst measured 4 by 6 by 7 1/2 centimeters. Microscopic section showed the wall of the cyst formed by compact fibrous tissue. In places there was an outer layer of adult fat. It appeared to replace most of the thickness of the fibrous wall there was some loose scattering of lymphoid cells usually in the fat near a junction with the fibrous wall, and occasional small, flattened-out collections of lymphocytes. No definite Hassell's corpuscles were seen in such areas. A single layer of flattened cells lines the cystic spaces. Occasionally these cells seemed thicker oval no cartilage was seen in the walls. Diagnosis: pericardial cyst, celomic type.

CASE 11. R. F. A. This 33 year old white male was completely asymptomatic. Routine roentgenogram demonstrated a tumor in the right lower chest just above the diaphragm. On admission to this hospital examination revealed decrease of the breath sounds over the right lung field, more noticeable anteriorly, there was very slight dullness of the right lung field in this region. Routine laboratory examinations were within normal limits, roentgenogram of the chest revealed a fairly well circumscribed density in the right supra-diaphragmatic region in the cardiophrenic angle appearing to be contiguous to the diaphragm. Thoracotomy with removal of the pericardial cysts was performed and recovery was uneventful. Pathological report showed a 10 1/2 by 9 1/2 by 6 1/2 centimeters transparent cyst filled with 200 cubic centimeters of clear watery fluid having a specific gravity of 1.007. Microscopic section showed the walls of the cyst to be fibrous, loosely arranged



Fig. 21

Fig. 22

Fig. 23.

Fig. 21. Preoperative esophagram. Case 18.

Fig. 22. Showing ciliated columnar epithelium.

Fig. 23. Postoperative esophagram.

and relatively acellular. The inner surface of the wall was lined by a single layer of slightly flattened cuboidal cells having dark staining oval nuclei. Diagnosis: Pericardial cyst, celomic.

CASE 12. E. L. A. This 34 year old white male was completely asymptomatic but a routine roentgenogram revealed a mass in the left lower lung field. On admission physical examination was negative except for examination of the chest which revealed dullness at the right base anteriorly up to the third rib. Tactile fremitus was absent at the right base. Breath sounds were normal except for this area where they were diminished to absent. Roentgenogram of the chest revealed an elliptical soft tissue mass in the anterior right thorax probably adherent to the pericardium and to the medial portion of the diaphragm. Routine laboratory studies were within normal limits. Bronchoscopy was negative. Bronchograms showed the filling defect apparently external to the pulmonary parenchyma. Exploratory thoracotomy revealed a large pericardial cyst which was easily removed. Recovery from surgery was uneventful. Pathological report showed a 12.5 by 11 by 6 centimeter cyst containing about 300 cubic centimeters of clear colorless fluid. Wall was paper thin. The cyst was unilocular with several paper thin, low baffle like ridges which could be seen as white fibrous bands through the outer surface. Microscopic showed no epithelial lining although occasional flat cells were seen as if the cysts had been lined by endothelium-like membrane. The wall was composed of acellular strands of connective tissue with fat present in half of the wall close to its original attachment to the mediastinum. A few small collections of lymphocytes were scattered in the wall. The outer surface was covered by a very thin fibrous membrane suggesting mediastinal pleura. Diagnosis: mediastinal cyst (pericardial celomic, congenital) (Figs 13 to 16).

Bronchial cysts of the mediastinum. These congenital cysts of the mediastinum are char-

acterized by ciliated columnar epithelium in their lining membranes. They are of endodermal and mesodermal origin and are generally supposed to arise from the pinching off of a bit of the foregut or tracheal bud which is carried into the mediastinum by the lungs. Cartilage and smooth muscle bundles are frequently present in their walls and the characteristic cellular lining is frequently destroyed by the pressure of the contained fluid, making diagnosis difficult in some cases unless many microscopic sections are taken to find characteristic epithelium in an untouched recess of the cyst. Treatment is complete excision if possible but Adams and Thornton (1943) reported good results in 2 cases following partial excision with destruction of the remaining lining mucosa. Laipply (1945) summarized the literature and with a case of his own reported a total of 35 cases.

We have 5 bronchial cysts of the mediastinum.

CASE 13. R. E. D. This 25 year old white male had a routine chest roentgenogram which showed a mediastinal tumor. Patient was completely asymptomatic. Physical examination was negative. Laboratory studies were within normal limits except roentgenograms of the chest which showed a large mediastinal mass on the right. Esophagram showed displacement of esophagus to the left by the posterior mediastinal mass. On thoracotomy a large cystic tumor of the posterior mediastinum was found that lay posterior to the base of the heart and anterior to the esophagus. The cyst was evacuated and the entire cyst wall was removed from the mediastinum *in toto*. Before it was opened, the cyst



Fig. 24.



Fig. 5



Fig. 36.



Fig. 7

Fig. 24. Preoperative roentgenogram Case

Fig. 5. Opened gross specimen showing fatty lobules

Fig. 36. Microscopic section showing fat cells

Fig. 7. Postoperative roentgenogram

measured approximately 15 centimeters in length and 8 centimeters in its greatest diameter. Postoperative course was uneventful. Pathological report showed one section of the cyst wall lined by ciliated columnar epithelium typical of that seen in the respiratory tract. The back of the wall was composed of a plate of hyaline cartilage and interposed between it and the respiratory epithelium were flattened mucous glands. Diagnosis cyst, ciliated, congenital, bronchogenic type, mediastinum.

CASE 14. C. L. S. This 24 year old white male noted chest pain and cough productive of large amounts of sputum 5 months previous to admission. One month after onset a chest roentgenogram revealed a large opacity in the lower lobe of the left lung. Diagnosis at that time was empyema with a bronchopleural fistula, left. Treatment was conservative during the first 5 months of his illness. On admission to this hospital, patient had been coughing up large amounts of mucopurulent sputum during the previous 5 months, with occasional episodes of moderate fever with temperatures running to 101 degrees. He had an indefinite pain in his left chest, transitory in type never severe. Physical examination was essentially negative except for moderate weight loss, dullness to percussion and absent breath sounds over the left base both anteriorly and posteriorly. A thoracotomy with drainage of a large abscess cavity in the lower portion of the left thorax was performed. A biopsy of the abscessed wall at that time showed a cyst lined with respiratory epithelium, ciliated. It was felt at the time that the patient had an intrapulmonary bronchogenic cyst, and he was treated conservatively for 3 months. At the end of that time an exploratory thoracotomy was performed and it was found that the cyst was extra pleural, and originating in the mediastinum. It was dissected free from the left lower lobe and the diaphragm, and amputated from its medial attachments in the mediastinum. The excised specimen collapsed, measured approximately 0.5 centimeters in diameter. Recovery was uneventful, and the left lung completely expanded (Figs. 7 to 10.)

CASE 15. E. F. This 25 year old colored male was asymptomatic. On routine chest roentgenogram, a mediastinal tumor was discovered. Physical examination was negative except for an area of dullness to percussion over the right anterior thorax extending about 8 centimeters from the midsternal line in the 5th intercostal space. Roentgenogram of the chest revealed a right mediastinal tumor area located between the spine and the heart, displacing the esophagus to the left. The carina was somewhat widened. Exploratory thoracotomy showed a large cystic mass about 8 by 8 by 10 centimeters in size lying behind the bifurcation of the trachea, and anterior to the esophagus. The contents were evacuated, and a cystic sac excised *in toto*. Recovery from surgery was uneventful. Pathological report showed the cyst wall to be composed of partially desquamated layer of ciliated epithelium. The wall contained bundles of smooth muscle which were hypertrophied in some areas, and in other areas the sub-epithelial tissues were composed of diffuse sheets of hyaline material. Diagnosis cyst bronchogenic, ciliated, mediastinum.

CASE 16. A. H. B. This 3 year old black male was well until 2 months previous to admission when he had bilateral infectious parotitis complicated by pneumonia. The pneumonia responded well to penicillin therapy but after recovery from the acute symptoms a large circumscribed intrathoracic tumor was discovered on the roentgenogram examination. On admission to this hospital, he was completely asymptomatic. Physical examination was negative. Laboratory studies were within normal limits with the exception of the roentgenograms of the chest which showed a large tumor mass in the base of the left lung, the heart shadow overlying most of it. It was located in the posterior portion of the left chest extending over to the posterior mediastinum. There had been no change in size since the previous film taken months before admission. Thoracotomy showed a large cystic mass at the base of the left lung seeming to originate in the posterior mediastinum below the hilum of the left lung. The cyst

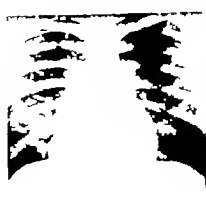


Fig 28



Fig 29



Fig 31

Fig 28. Roentgenogram 2 years before first thoracotomy. Case 12.

Fig 29. Preoperative roentgenogram, first thoracotomy.

Fig 30. Gross specimen, first thoracotomy.

Fig 31. Postoperative roentgenogram, first thoracotomy.



Fig 30

markedly adherent to the left lung and to the left diaphragm. By blunt and sharp dissection the cyst was removed *in toto*. The thorax was closed and the patient returned to the ward in good condition. Postoperative course was uneventful with the exception of a transient atelectasis which was treated by bronchoscopy on the second postoperative day. Pathological report showed a large cyst approximately 12 centimeters in diameter with a shaggy external surface caused by numerous fibrous adhesions. The cyst was filled with a yellowish clear fluid and sections through the wall showed plates of hyaline cartilage and the cyst lined with respiratory epithelium, ciliated. Diagnosis: cyst bronchogenic ciliated mediastinum.

CASE 17. B. I. J. This 22 year old white male had mild intermittent chest pain of 6 years duration. Roentgenograms taken during the 6 year period were reported alternately as showing "tumor" in the chest and negative. In 1943 he was rejected by the Army but in 1944 was admitted to the Army. He completed basic training and served on combat duty 8 months in the European Theater. At the termination of this time he complained of chest pains however roentgenograms were read as negative. During a routine chest examination while undergoing separation roentgenograms were interpreted as showing neoplasm upper mediastinum, nonmalignant. On admission to Fitzsimons General Hospital physical examination was essentially negative except for soft rales in the right upper chest anteriorly. No evidence of cavitation or consolida-

tion was found on physical examination. Roentgenograms showed a sharply circumscribed tumor mass in the right superior mediastinum with minimal fibrosis at the left apex. Routine laboratory studies were within normal limits. Bronchoscopy was negative. On May 22, 1946 thoracotomy revealed that a mediastinal bronchogenic cyst which was easily removed. Recovery from surgery was uneventful. Pathological report showed a cyst measuring 3.5 by 2.8 by 2.3 centimeters containing very thick jelly like mucus lining was irregular greyish with scattered small, milk white hyalinized bosses. A circular ridge extended from the first ridge to one pole. These ridges were rubbery firm and felt as if they might contain small cartilaginous plates. Microscopic examination showed an outer zone of loose, fibrous tissue with blood vessels and occasional nerves where the cyst was embedded elsewhere the outer surface was covered by thin mediastinal pleura. Cyst wall within was composed of dense compact, hyalinized fibrous tissue covered by a thin flattened epithelium thick portions of the wall consisted of thick bundles of smooth muscle cells with a few mucous glands and ducts between the muscle layers lining epithelium in these areas was ciliated pseudostratified cylindrical epithelium. In one area the epithelium was lost and here the cells of underlying stroma showed xanthomatous degeneration. Small collections of lymphocytes are scattered through the wall and in the midzone usually around the engorged capillaries. Diagnosis: bronchogenic cyst congenital.



Fig. 33

Fig. 3 Recurrence of tumor 2 years after first thoracotomy. Case 22.



Fig. 33

Fig. 33 Gross specimen removed after bilateral thoracotomy.

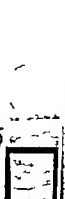


Fig. 34

Fig. 34 Shows myxomatous type tumor and loose fibrovascular tissue enclosing tract.



Fig. 35

Fig. 35 Postoperative roentgenogram after bilateral thoracotomy.

Esophageal cysts and gastroenteric cysts

These cysts are discussed under one heading because of their similar embryonic origin. Olken in his excellent review in 1944 summarized three possible explanations for these cysts: (1) pinching off a bud or diverticulum of the embryonic foregut; (2) an intrathoracic remnant of the omphalomesenteric duct; and (3) an embryonic diverticulum or epithelial remnant capable of producing intestinal or gastric mucosa.

Esophageal cysts would be expected to have a stratified squamous epithelium lining. However, since esophageal cysts are remnants of the embryonic esophagus, which has ciliated epithelium, it is reasonable to assume that the cysts could maintain the primitive lining instead of assuming the lining found in the developed esophagus. The possibility that these cysts, in close association with the esophagus, are of bronchial origin cannot be ignored because at the time of separation of the lung buds from the primitive esophagus, the pinching off of an outbud could occur and become engulfed in the growing esophagus. Therefore, the gross location of these cysts will have to determine their origin: those included within the muscularis of the esophagus can be called esophageal cysts; those located in the rest of the mediastinum or lung can be of bronchial origin. Frequently in bronchiogenic cysts cartilage is found in the cyst wall. We present one case in this group that of a ciliated pseudostratified columnar epithelium

line cyst that was located between the mucosa and the muscularis of the esophagus.

CASE 18. A. J. P., a 22 year old white male, has complained of "water-brash" and regurgitation a food of 6 years duration. While in combat his father and roentgenograms showed a pressure defect in the esophagus. The patient was returned to the zone in the interior where roentgenograms confirmed a slight pressure defect in the lower third of the esophagus. Thoracotomy showed an esophageal cyst located between the mucosa and the muscular layers. The cyst was enucleated without entering the lumen of the esophagus. It contained fluid. Pathological report showed a cyst with ciliated epithelial lining. Diagnosis: ciliated cyst esophageal, congenital (Fig. 31-33).

Gastroenteric cysts are characterized by the resemblance to gastric and intestinal structures. They are rare with only 19 cases found by Olken including 1 of his own; 5 more reported by Ladd and Scott, and 1 by Lappley. All but 3 were in children under 2 years of age. Ladd and Scott had recovery in 3 cases following marsupialization of the cyst and subsequent destruction of its mucosal lining.

Cystic lymphangiomas. These tumors are also called "cystic hygromas." They are extremely rare in the mediastinum. Sames and associates were able to collect 8 cases from American and foreign literature, including 2 cases of their own. Cystic lymphangiomas are characterized by multiloculated cysts containing fluid with an endothelial lining and smooth muscle and lymphocytes in the walls.



Fig. 36.



Fig. 37



Fig. 38

Fig. 39

Fig. 36. Preoperative esophagram showing multiple filling defects. Case 23

Fig. 37. Leiomyomas removed at mediastinotomy

Fig. 38. Photomicrograph showing interlacing bundles of smooth muscle

Fig. 39. Postoperative esophagram.

ACQUIRED CYSTS

This group of cysts is mentioned mainly to be kept in mind in differential diagnosis. Echinococcus cysts of the mediastinum are extremely rare compared to the same type of cyst of the lung. Neoplastic cysts are due to degeneration of a solid tumor and any solid tumor in this classification may show these characteristics more usually the highly malignant types. Hemothorax, other than traumatic, can come from rupture of an aneurysm degeneration of a neoplasm, or spontaneous hemopneumothorax. In unusual cases they may simulate mediastinal tumors.

CONNECTIVE TISSUE TUMORS

Fibromas In 1941 Blades reported 32 cases of intrathoracic fibromas in the world literature indicating the rarity of the lesion. Of these cases 18 died of pressure symptoms unoperated upon and of the 14 cases in which operation was done all lived except one. Clagett and Hausmann (14) successfully removed a 10.9 pound fibroma which they claimed to be the largest intrathoracic tumor ever removed surgically with survival and complete recovery of the patient. Of the 18 cases collected by Heuer and Andrus (28) in 1933 only 5 below the age of 40 had symptoms suggesting that these tumors are silent for years before symptoms occur.

Lipomas Most of the intrathoracic lipomas originate in the mediastinum as evi-

denced by Heuer's report (26) in 1933 on 29 cases—25 occupied the mediastinum and 4 were subpleural. They may attain giant size and cause death from pressure symptoms. In Heuer's case the tumor filled the entire left hemithorax with displacement of heart and mediastinal contents far to the right. McCorkle and associates collected 34 cases in 1940 and of these only 12 were successfully excised. Watson and Urban and Wiper and Miller each have added successful cases (undoubtedly there are more). We have 3 cases of successful extirpation of a mediastinal lipoma.

CASE 19. R. R. D., a 37 year old white male had a routine chest roentgenogram which showed a mediastinal mass. History and physical examination were completely negative. Laboratory studies were negative with the exception of roentgenograms of the chest which showed an ovoid tumor mass anteriorly in the right cardiophrenic angle considered to be possibly a dermoid or substernal diaphragmatic hernia. A gastrointestinal series showed a herniation of the stomach or bowel through the diaphragm. Thoracotomy showed a fatty tumor mass approximately 5 centimeters in diameter located in the cardiophrenic angle on the right. This was easily removed. Patient returned to the ward in good condition and recovery was uneventful. Pathological report showed a lobulated adipose mass. No noteworthy pathology was seen.

CASE 20. R. L. H., a 30 year old white male had a mediastinal mass which was seen on routine roentgenogram of the chest. History and physical examination were completely negative. Laboratory studies were negative with the exception of roent-



Fig. 32

Fig. 32. Recurrence of tumor 3 years after first thoracotomy. Case 32.



Fig. 33

Fig. 33. Gross specimen removed at bilateral thoracotomies.

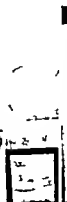


Fig. 34

Fig. 34. Show myxomatous type areas and large loose fibrovascular tissue enclosing tumor.



Fig. 35

Fig. 35. Postoperative roentgenogram after bilateral thoracotomy.

Esophageal cysts and gastroenteric cysts
These cysts are discussed under one heading because of their similar embryonic origin. Olken in his excellent review in 1944 summarized three possible explanations for these cysts: (1) pinching off a bud or diverticulum of the embryonic foregut; (2) an intrathoracic remnant of the omphalomesenteric duct; and (3) an embryonic diverticulum or epithelial remnant capable of producing intestinal or gastric mucosa.

Esophageal cysts would be expected to have a stratified squamous epithelium lining. However, since esophageal cysts are remnants of the embryonic esophagus which has ciliated epithelium, it is reasonable to assume that the cysts could maintain the primitive lining instead of assuming the lining found in the developed esophagus. The possibility that these cysts, in close association with the esophagus, are of bronchial origin cannot be ignored because at the time of separation of the lung buds from the primitive esophagus the pinching off of an outbud could occur and become engulfed in the growing esophagus. Therefore the gross location of these cysts will have to determine their origin: those included within the muscularis of the esophagus can be called esophageal cysts; those located in the rest of the mediastinum or lung can be of bronchial origin. Frequently in bronchogenic cysts cartilage is found in the cyst wall. We present one case in this group that of a ciliated pseudostratified columnar epithelium

line cyst that was located between the mucosa and the muscularis of the esophagus.

CASE 18. A J. P., a 22 year old white male, had complained of "water brash" and regurgitation of food of 6 years' duration. While in combat he failed and roentgenograms showed a pressure defect in the esophagus. The patient was returned to the zone of the interior where roentgenograms confirmed a single pressure defect in the lower third of the esophagus. Thoracotomy showed an esophageal cyst located between the mucosa and the muscular layers. The cyst was enucleated without entering the lumen of the esophagus. It contained fluid. Pathological report showed a cyst with ciliated epithelial lining. Diagnosis: ciliated cyst, esophageal, congenital. (Figs 21-23.)

Gastroenteric cysts are characterized by the resemblance to gastric and intestinal structures. They are rare, with only 19 cases found by Olken including 1 of his own, 5 more reported by Ladd and Scott and 1 by Lapp. All but 3 were in children under 2 years of age. Ladd and Scott had recovery in 3 cases following marsupialization of the cyst and subsequent destruction of its mucosal lining.

Cystic lymphangiomas These tumors are also called cystic hygromas. They are extremely rare in the mediastinum. Sances and associates were able to collect 8 cases from American and foreign literature including a case of their own. Cystic lymphangiomas are characterized by multiloculated cysts containing fluid with an endothelial lining and smooth muscle and lymphocytes in the walls.



Fig. 36



Fig. 37



Fig. 38

Fig. 39

Fig. 36 Preoperative esophagram showing multiple filling defects. Case 23.

Fig. 37 Leiomyoma removed at mediastinotomy.

Fig. 38 Photomicrograph showing interlacing bundles of smooth muscle.

Fig. 39 Postoperative esophagram.

ACQUIRED CYSTS

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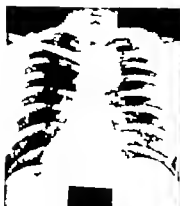


Fig. 40



Fig. 41



Fig. 42

Fig. 43

Fig. 40. Preoperative roentgenogram, posterior-anterior view. Case 27.

Fig. 41. Preoperative roentgenogram, lateral.

Fig. 42. Gross specimen.

Fig. 43. Showing interlacing bundles of nerve tissue without palisading.

genograms which showed a mass to the right of the cardiac shadow in the cardiophrenic angle which appeared to be a pericardial cyst. Thoracotomy was performed and the mass was easily removed. Recovery was uneventful. Pathological report showed an irregular oval mass 6 by 5 by 5 centimeters enclosed in a transparent fibrous capsule. Microscopic section showed uniform picture of adult fat cells with fine widely spaced fibrous strands outlining indefinite lobules. Diagnosis: lipoma, adult sized type, mediastinum.

CASE 31. T. H. P. This 44 year old white male was admitted to the hospital complaining of symptoms referable to an indirect inguinal hernia. On routine roentgenograms of the chest, a mediastinal tumor was discovered. History of any chest complaints was completely negative. Physical examination was essentially negative. Laboratory studies were within normal limits with the exception of the chest roentgenogram which showed a rounded shadow sharply circumscribed inferiorly and laterally seen in the right chest suggesting a cyst. The shadow lay posteriorly. Lung markings traversed the area anterior to the mass. The tumor was not so dense as to obliterate the rib markings. Fluoroscopy showed no connection to the cardiovascular elements although the medial attachment of the tumor could not be rotated away from the hilar or mediastinal shadows. There was no pulsation in the tumor. Exploratory thoracotomy through a right Sauerbruch thoracoplastic incision showed a large circumscribed fatty tumor mass. This was removed, the chest closed and recovery from surgery was uneventful. Pathological report showed an oval flabby undurated yellow fat tumor weighing 225 grams, measuring 11 by 8.5 by 6.5 centimeters in diameter. Microscopic section showed the tumor to be composed for the most part of adult fat cells, but in some areas the appearance was more cellular with an increased number of spindle cells and fibrocytes and with fat cells that appeared partially collapsed and slightly opaque. No mitoses were seen. Diagnosis: lipoma.

mediastinal, growing into right pleura, benign (Figs. 24-27).

The mixed types of fatty tumors would come under this heading such as the fibrolipomas and fibrolipomyxomas. We have one case of fibrolipomyxoma that was operated upon in 1942 but had recurrence bilaterally in 1944. In a two stage procedure, operating on both sides the tumor was apparently removed.

CASE 32. D. E. G. This 38 year old colored male was first operated upon by Dr. Thomas J. Knudsen, of Minneapolis. He had a mediastinal tumor known for 18 months which measured 11 by 16 by 16 centimeters at the time of operation. The tumor was removed from the right posterior chest and mediastinum and the gross specimen appeared to be well encapsulated but Dr. Knudsen felt that recurrence probably would occur. The pathological diagnosis was benign degenerating fibroma. Two and one-half years following his first operation, he was admitted to this hospital complaining of epigastric distress which was consistent with the diagnosis of duodenal ulcer. During his routine stomach x-ray a plate was taken which showed multiple, small round tumor masses in the cardiophrenic angles, bilateral. Thoracotomy was performed on the right, and multiple tumor masses were removed from along the sympathetic chain on the right—the largest measured 10 by 6 centimeters in diameter. One of the masses was almost gelatinous in character, and the operator felt that it was not removed entirely. Two and one-half months after the first operation at this hospital, thoracotomy on the left was performed and four distinct tumor masses were removed from the mediastinum in the region of the sympathetic chain and ganglia. Three nerves passed into the tumor masses. Grossly it was felt that these masses had their origin in nerve tissue. Recovery from both operations was uneventful except for mild

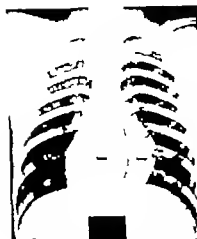


Fig. 44.



Fig. 45



Fig. 46



Fig. 47

Fig. 44. Preoperative roentgenogram posteroanterior
Fig. 45. Preoperative roentgenogram lateral. Case 20

Fig. 46. Gross specimen, encapsulated ganglioneuroma
Fig. 47. Showing neurofibrils surrounding ganglion cells

atelectasis which developed on the second postoperative day following the second operation and which was treated by bronchoscopic aspiration. Check-up plates taken a month postoperatively showed no evidence of tumor masses remaining in the mediastinum. Patient was advised that he would have probable recurrence and should have frequent x ray examinations of his chest in the future. Pathological report on all tumor masses was identical. Microscopic sections showed adipose tissue with irregular walls many of the cell processes appeared to be going on into a myxomatous type of degeneration and the cells were stellate with hypochromatic nuclei and interlacing cytoplasmic fibrils. No mitotic figures were seen nor were there sheets of cells. At the periphery of one section the spindle cells and occasional stellate cells were more numerous appearing to form a capsule. Impression: Tumors appeared to be benign and encapsulated and apparently were myxomatous degeneration of lipid tissue. Diagnosis: myxolipoma benign. (Note: Dr Thomas J. Kinsella has reviewed all slides and agrees that the original diagnosis from the specimen taken by him should be myxolipoma, benign.) (Figs 28 to 35)

Leiomyomas These tumors can occur in the mediastinum, but diagnosis is impossible until biopsy is performed preferably at the time of total excision of the mass. It is important to remove them because of the possibility of sarcomatous degeneration in this type. An interesting case in our series showed multiple pressure defects of almost the entire intrathoracic esophagus, with intact mucosa on esophagoscopy. At operation 14 intramural extramucosal tumors of the esophagus were removed which proved to be leiomyomas on microscopic section.

CASE 23. C. S. A 33 year old white male complained of substernal pain on swallowing of 2½ years duration and a sensation of pressure defects in the esophagus. Esophagoscopy confirmed the multiple pressure defects and stated they were all extraluminal. No evidence of ulceration in any area was seen. Physical examination and laboratory studies were within normal limits. Thoracotomy showed multiple tumor nodules along the entire length of the thoracic esophagus, varying in size from about 4 centimeters to 1 centimeter. One of these masses was removed for a frozen section. Pathological report was leiomyoma of the esophagus. A total of 14 esophagus tumors were removed the tumors were located in and beneath the musculature of the esophagus, but caused no erosion of the mucous membrane. At no time was the lumen of the esophagus entered. Recovery from the operation was uneventful. Pathological diagnosis: multiple leiomyomas of the esophagus (Figs 36 to 39).

Xanthomas These tumors occur in the mediastinum as elsewhere in the body. They are considered benign but may go on to form xanthosarcomas. Heuer and Andrus (26) collected only 10 cases of this type in 1940 including 2 of Dr Heuer's. The tumors occurred only in adults and all 10 were successfully removed. It is questionable that these tumors should be considered as a separate type as they seem to be more of a degeneration process in tumors such as lipomas and fibromas.

Chondromas **Chondromyxomas** **Chondrosarcomas** These tumors originate from cartilage which is found adjacent to the mediastinum in the sternum costal cartilages

and articular surfaces of the spine and costo-vertebral junctions. They are important in that they attain great size and may metastasize even though benign on microscopic section. Heuer and Andrus (27) found in the literature since 1926 only 14 that involved the mediastinum. Surgical removal is indicated as they do not respond to radiation therapy and resection is facilitated by the infrequency of invasion of surrounding structures.

NEUROGENIC TUMORS

Pathological discussions of neurogenic tumors are based on work done by Von Fischer and Kuntz. These tumors arise from the sympathetic nervous chain or its anlagen and are manifestations of the development from the original medullary epithelium. As the cells migrate from the ganglionic crest they may form cell rests at various stages in their development which proliferate to form the neurogenic tumors. Using the chart published by Andrus in 1937 a simplified method of showing the origin of the thoracic neurogenic tumors is presented.

Medullary epithelium	→ Neuroepitheliomas
Ganglionic crest	→ Neuroepitheliomas
Migrating undifferentiated cell	→ Neuroblastoma (schwannoma)
Sympathicoblast	→ Sympathicoblastoma
Neuroblast	→ Neuroblastoma
Sympathetic ganglion cell	→ Gangliocytoma
Primitive mesenchyme	
Fibroblast	→ Neurofibroma (Neurofibrosarcoma)

Neurofibromas. The origin of these tumors from one of the three nerve sheaths caused Verocay to suggest the term 'neurofibrosarcoma'. These tumors are thought to come from the perineural or endoneurial fibrous tissue and are distinguished from the tumors of the sheath of Schwann which are characterized by elongated fusiform cells with 'pallisading' of the nuclei. The two types of tumors are frequently confused. Heuer and Andrus (27) collected 20 authentic cases of intrathoracic neurofibroma and added 1 case. They also collected 19

cases of neurinoma (schwannoma) showing that the relative frequency is about equal. We can add 3 cases of neurofibroma and 1 case of schwannoma, all originating in the mediastinum.

CASE 24. J. A. V. This 33 year old white male complained of dull pains around his heart, associated with mild shortness of breath of 8 months duration. Five months after the onset of his complaint, chest roentgenogram showed a mass in the left mediastinum which seemed to be contiguous with the aortic outline. Fluoroscopy and electrocardiogram ruled out aortic aneurysm. Generalized lymphadenopathy developing 7 months after onset of his complaint complicated the picture, and the possibility of a lymphoblastoma was entertained. However, a biopsy showed reactive hyperplasia. Heterophile antibody agglutination was positive, and a diagnosis of mononucleosis, infectious, was confirmed. Following recovery from infectious mononucleosis, thorcotomy was performed which showed a tumor mass approximately 8 centimeters in diameter lying beneath the mediastinal pleura just above the superior aspect of the arch of the aorta. The left subclavian artery was stretched tightly over the tumor mass. The tumor was enucleated by blunt and sharp dissection and from gross appearances was completely removed. Recovery from surgery was uneventful. Pathological report was neurofibroma, benign, posterior mediastinum, left.

CASE 25. L. T. H. This 31 year old white male had a routine chest roentgenogram which showed a mass in the left posterior mediastinum. Except for a dry cough for a number of years, history was completely negative. Physical examination and laboratory studies were negative except for the roentgenogram which showed a dense rounded mediastinal tumor in the posterior mediastinum on the left, extending from the upper border of the sixth rib posteriorly to the lower border of the ninth rib posteriorly. Thorcotomy was performed and a tumor was removed from the posterior mediastinum on the left. Several pedicles which apparently represented nerve tissue extended into the intercostal spaces. These pedicles were clamped and ligated, and the tumor was removed. Recovery from operation was uneventful. Pathological studies showed an egg-shaped tumor mass 7.5 by 6 centimeters with a smooth, greyish yellow capsule. Microscopic section showed the tumor to be composed of fibrous tissue, nerve fibers, and xanthoma cells, but no true myxomatous tissue. Diagnosis: mesenchymal tumor including nervous and fibrous tissue and xanthoma cells, benign, predominantly neurofibroma.

CASE 26. D. L. This 22 year old white male was discharged from the Navy in November 1945. He was told he had a tumor in his chest and should have a recheck in 4 months. He later applied for work in a steel mill and the tumor was seen again on roentgenograms. He was advised to have it removed later.



Fig. 48.

Fig. 49.

Fig. 50.

Fig. 51.

Fig. 48. Preoperative roentgenogram no evidence of enlarged thymus. Case 30.

Fig. 49. Gross specimen, thymus removed *in toto*.

Fig. 50. Showing lymphoid tissue and Hassall's body.

Fig. 51. Postoperative roentgenogram after mediastinotomy through sternum.

duately. On admission to the hospital patient had no complaints. Physical examination was essentially negative. Laboratory studies were negative except for the roentgen ray examination which showed a left posterior mediastinal tumor arising from the region of the 6th thoracic foramen. There was a very slight calcification on the inferior margin of the 6th thoracic pedicle which suggested a dumbbell type of neurofibroma. Thoracotomy was performed and a solid mass in the left posterior mediastinum was easily removed. There was no pedicle extending to the 6th thoracic vertebra. Recovery from surgery was uneventful. Pathological report showed a spherical 4 centimeter mass with a smooth and glistening surface. Microscopic section showed the tumor capsule to be composed of coarse hyaline connective tissue and the tumor was composed of interlacing bundles of elongated eosinophilic cells with hyperchromatic nuclei. In many areas palisading was marked and fibers were delicately fibrillar. No evidence of malignant changes noted. Diagnosis: neurinoma (schwannoma) degenerating mediastinum, left.

CASE 37 F. R. B. This 31 year old white male was completely asymptomatic. Routine roentgenogram was read as showing a spot of the upper lung field on the right. Admission physical examination and routine laboratory studies were negative. Roentgenograms showed a lobulated mass in the superior mediastinum on the right. Bronchoscopy was negative. Thoracotomy revealed a firm tumor mass at the level of the second, third, and fourth ribs in the posterior mediastinum. It was removed by blunt and sharp dissection. Recovery from surgery was uneventful. Pathological report showed a reniform encapsulated mass weighing 62 grams measuring 8.2 by 3.8 by 3.3 centimeters enclosed by a thin fibrous capsule. One surface has three transverse poles dividing it into three almost equal lobules. The cut surface showed the smallest lobule to be greyish

translucent and uniform, the two larger lobules contained indefinitely outlined opaque orange yellow areas suggesting xanthomatous change rather than caseation. The rest of the tissue was greyish translucent. The middle lobule showed cystic degeneration and hemorrhage. Microscopic examination showed a fibrous capsule enclosing the tumor. In addition there was fat outside the capsule where the tumor was detached from its bed. Other sections showed thin pleura covering the capsule where it bulged into the pleural space. The tumor was composed of interlacing bundles of spindle nerve cells with some areas where palisading of nuclei was visible. Many engorged capillaries were present in the tumor. Many areas of edema with small cystic spaces were found. Other areas showed well marked cystic degeneration with hemorrhage in tissue around the small cysts. In one such area there were collections of closely approximated, hyalinized thick walled vessels suggestive of sclerosing anglioma. The opaque, orange, yellow areas seen grossly were areas of xanthomatous degeneration lying close to the capsule. The nuclei of the rather plump spindle tumor cells varied in size but mitosis was not seen. In the areas of cystic degeneration there was some round cell infiltration. Impression: This was a neurofibroma with areas suggesting neuroma with cystic degeneration some hemorrhage and xanthomatous degeneration. Diagnosis: neurofibroma, intrathoracic mediastinal, benign. (Figs. 40 to 43.)

Ganglioneuromas In 1932 Scott and Palmer reviewed the tumors of the peripheral sympathetic system and adopted a classification listing the tumors according to degree of differentiation. This was similar to the work done by Von Fischer in 1922. Ganglioneuroma lies with pheochromocytomas and astrocytomas in the completely differentiated group. There is

a very low tendency toward malignancy varying inversely with the age of the patient. Heuer and Andrus (27) collected 68 cases of intrathoracic ganglioneuromas including one of their own. Seventy four per cent of those cases with stated age were in children under 10 years. The prognosis is good if the tumor is surgically removable. We have 2 cases of this type to present.

CASE 18. A. P. T. This 22 year old white male first noted chest symptoms of dyspnea, dizziness, and pain in the left chest approximately 8 years previous to admission. He was sent overseas where he participated in combat duties with an infantry regiment. Because of chest symptoms, roentgenogram examination of the chest was performed and a diagnosis of tumor type undetermined was made. On admission his only complaints were dyspnea, mild, and intermittent mild pains in the left chest. Physical examination was completely negative except for dullness to percussion and absent breath sounds over the posterior left chest up to the level of the 5th rib. Roentgenogram examination showed a large sharply circumscribed opacity occupying the lower one third of the left lung field. There was no evidence of erosion of bone. Exploratory thoracotomy showed a large firm tumor mass occupying the posterior portion of the thoracic space. The tumor was densely adherent to the posterior chest wall at the level of the 5th to the 10th rib. It was lobulated and had a consistency of a neurofibroma or a ganglionic neuroma. It was entirely covered by pleura. The tumor was removed by blunt and sharp dissection and it was found to be originating in the posterior mediastinum on the left where a large branch of the aorta entered directly into the tumor mass. Recovery from the operation was uneventful. Pathological report showed a non malignant neoplasm—neuroma ganglionic, of left posterior mediastinum.

CASE 20. H. A. N. This 9 year old white male was completely asymptomatic. While he was undergoing routine examination for re-enlistment for the regular Army a roentgenogram was taken which showed a mass just to the right of the heart and seemed associated with the cardiac shadow. It was thought at that time that the patient had a cardiac condition. Cardiac studies were negative however and he was returned to active duty. Five months later he was admitted to a regional hospital because of frequent blackout episodes. These attacks came on rapidly and were explained by the patient as sudden "blacking out" during which time he would fall to the floor but would not lose consciousness. These episodes would last about 1 hour accompanied by generalized weakness. The attacks were followed by severe frontal headache lasting 5 to 6 hours. Chest roentgenograms taken at that admission showed the mass to be extracardiac in origin. He was transferred to this hospital for further treatment. Routine

laboratory examinations were within normal limits. Roentgenograms of the chest revealed a widening of the posterior mediastinum on the right back was very sharply outlined laterally. Fluoroscopic examination revealed no pulsation and no connection with the cardiac shadow. Examination of the esophagus by means of barium by mouth revealed no displacement or abnormality of the esophagus. The mass on the right had more of the appearance of an encapsulated pleural fluid pocket medially than that of a tumor mass. The complaints of "blackout periods" ceased and neurological clearance was given. Exploratory thoracotomy showed a large tumor mass in the posterior mediastinum extending into the posterior gutter of the right chest which was removed by blunt and sharp dissection. Postoperative course was uneventful. Pathological examination showed an oval encapsulated tumor weighing 200 grams and measuring 15 by 9.5 by 5.5 centimeters. The capsule was thin, permitting underlying pale, greyish yellow tumor tissue to be seen. A paper thin, smooth membrane covered the free surface and represented the stretched mediastinal pleura. The "attached" surface was rough, covered by a ragged sheet of fatty tissue extending from one pole to within 3.5 centimeters of the opposite pole and from one border to within 2 centimeters of the opposite border. Cut surface bulged and had a translucent appearance and slippery mucinous feel of myxomatous tissue. Cut surface consisted of indistinctly lobulated, translucent, rubbery dirty greyish, yellow tissue bulging as distinct nodules which occupied almost one half and extended into the opposite half for 6 to 3.5 centimeters. Between these firmer areas is more lumpy greyish, tan tissue. Fine white, fibrous streaks traversed the tumor. Vessels are not visible. There was no gross hemorrhage or necrosis. Microscopic section showed variation of tumor tissue in different areas. In some areas near the surface it was composed of definitely outlined, small nerve bundles separated by an edematous, fibrillar stroma. There was further tearing apart of the nerve bundle so that irregular bands of nerve fibrils irregularly arranged were scattered in the mucinous edematous stroma. Solitary ganglion cells and groups of ganglion cells were scattered here and there through the tumor and in some areas the tissue was quite suggestive of ganglion having been included in the tumor. Several fairly large nerves were buried in the tumor. The ganglion cells showed varying degrees of degeneration some had fenestrated borders, satellite cells were frequently seen surrounding the such granular cytoplasm of a ganglion cell in which a nucleus was seen. Only occasionally were definite ganglion cell nuclei recognizable. The loose fibrillar meshwork filled with edema fluid which supported the nerve bundles did not appear to be myxomatous tissue but was rather a mucinous degeneration of the stroma. Impression Ganglioneuroma arising apparently from the paravertebral ganglion showing extensive mucinous degeneration. It appeared benign and grossly was completely removed. Diagnosis

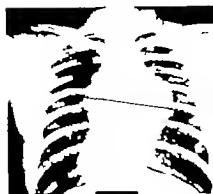


Fig. 52.



Fig. 53.



Fig. 54.



Fig. 55.

Fig. 52. Preoperative roentgenogram showing thymic tumor. Case 31.

Fig. 53. Showing alveolar arrangement of tumor cells.

Fig. 54. Post-radiation roentgenogram, posteroanterior. No evidence of tumor.

Fig. 55. Post-radiation roentgenogram, lateral.

ganglioneuroma, paravertebral intrathoracic, posterior mediastinum, right benign. (Figs. 44 to 47.)

Neuroblastomas and neuroepitheliomas. These tumors are examples of the more malignant types of neoplasms derived from the nervous system. In the thorax they are most frequently seen in the mediastinum because of the concentration of sympathetic nervous elements in that area. Although malignant good results can be obtained by surgical removal when the tumor is localized.

PRIMARY TUMORS OF THE THYMUS

There is considerable confusion in the literature regarding classification of the tumors of the thymus. Pathologically the tumors fail to fall into well defined groups making classification a very controversial subject. Indeed the reports of the tumors sometimes fall into groups according to nationality. Ewing states:

It is significant that the carcinomas have been recorded almost entirely by French observers, while practically all the German reports are of sarcoma. The authors cannot alleviate the confused situation we are mentioning these tumors merely to be considered in differential diagnosis.

Benign thymomas. The present knowledge of the relationship between myasthenia gravis and tumors of the thymus is sketchy. Following the work of Blalock, the surgical approach to the treatment of the disease has been attempted in some cases but the results have been far from conclusive. Viets reported the cases of 15 surgically treated patients; 4 showed thymomas, 3 showed thymus hyper-

plasia, and the rest were normal thymuses. One of the patients with a normal thymus had complete remission of the symptoms of myasthenia gravis. Of the 4 with thymomas there was no indication that they were more improved than those with hyperplasia or those whose thymus was normal. Since neostigmine has been so successful in the treatment of most cases of myasthenia gravis it is well to take the conservative view and defer surgery except in those patients who show an enlarged thymic shadow on x-ray examination. We have one case of thymus hyperplasia which showed improvement following thymectomy.

CASE 30. H. H. W. This 58 year old Japanese male had been complaining of diplopia, bilateral ptosis, weakness of the jaw on biting and hoarseness and vocal fatigue, increasing in severity during the previous 10 months. Three months previous to admission he was examined at another hospital where the diagnosis of myasthenia gravis was confirmed when the patient improved on prostigmine bromide therapy which was given every 2 hours in alternating doses of 30 milligrams and 15 milligram. He also received $\frac{3}{4}$ of a grain of ephedrine sulfate three times daily. On this therapy all of his symptoms improved except the diplopia. He was transferred to this hospital for thymectomy. On admission here physical examination showed a moist skin, pupils reacted normally to light and accommodation. There was a marked ptosis on the left and moderate ptosis on the right. There was an apparent slight internal strabismus. There was some weakness of the neck muscles and some weakness of the muscles of the upper extremities more pronounced on the right in the extensor groups. All other findings were within normal limits. Laboratory examination was within normal limits except for the white count which showed 21,000 white cells with 86 per cent polymorphonuclears. Roentgen ray examination on

admission was negative. Previous to surgery the prostigmine therapy was discontinued for 3 to 4 days then the patient was given 10 grains of quinine orally in the morning and at noon. During the afternoon, he complained of marked weakness of his neck muscles of such proportions that he could not raise his head from the bed. There was also an increase in the ptosis, more marked on the left. Fluoroscopy was performed with a barium swallow showing diminished swallowing time which promptly returned to normal following $1\frac{1}{4}$ milligrams of prostigmine intramuscularly with improvement of the ptosis and the diplopia. Following this diagnostic test the thymus was removed through a sternum splitting incision from which the patient recovered uneventfully. The pathological report showed an irregularly shaped thymus gland weighing 65 grams with an overall length of 18½ centimeters. Microscopic section showed a diffuse hyperplasia of both cortex and medulla. The cortical endothelial cells were prominent, and the medulla epithelial elements were hyperplastic with unusually large thymic corpuscles. No malignant changes were noted. Diagnosis: thymic hyperplasia benign. Postoperatively there was marked improvement of all the symptoms of myasthenia gravis but patient continued to have moderate generalized weakness and diplopia. It was found that a single dose of prostigmine 0.5 milligram, given intramuscularly before arising, gave him marked improvement in the diplopia and the generalized weakness. Patient was discharged 4 months after thymectomy his general condition markedly improved (Figs 48 to 51).

Malignant thymomas These tumors have been classified by Ewing as falling into two groups (1) lymphosarcoma or thymoma (2) carcinoma. He adds a third group called spindle-cell or myxosarcoma, which is very rare. The first group (lymphosarcoma) he considers as originating from reticulum cells with the lymphocytes being largely passive. This is the most common type. These tumors may be encapsulated within the mediastinum or may assume invasive properties and metastasize to distant sites. Surgery should be attempted in every case even if only for biopsy if the lesion appears localized. X-ray therapy in inoperable cases has been reported as useless but should be attempted in all cases because of the frequent pathological confusion with more radiosensitive tumors. We have one case of thymic carcinoma which has responded remarkably to deep x-ray therapy but the follow up is too short to evaluate the case at present (12 months after surgery was carried out).

CASE 31 R. C. W. This 30 year old male only had a tumor of the right anterior mediastinum discovered on routine chest roentgen-ray examination at a separation center. The patient had no cardiorespiratory symptoms except for asthma which he has had since the age of 5 and which has been much improved during the past 3 years. Physical examination was essentially negative except for decreased breath sounds, decrease in vocal fremitus, and a few rales to the right of the sternum between the third and fifth intercostal spaces. Laboratory studies were within normal limits with the exception of chest roentgenograms which showed a large anterior mediastinal mass measuring approximately 12 by 14½ centimeters in diameter. There appeared to be beads of calcification along the wall along the right inferior border of the mass and the impression was an anterior mediastinal tumor probably teratoma. A sternum splitting incision was made, mediastinotomy was performed, and a large firm tumor mass was found in the anterior mediastinum. This mass was freed up along the left border, but in several places along the posterior aspect of the tumor it had invaded the pericardium and was densely adherent to the underlying great vessels. Exploration of the vena cava and the bronchial veins showed that the tumor was apparently invading the lumen of the vessels. A section of the tumor was taken for frozen section, and the report was malignant thymoma. The mediastinum was closed, and the patient returned to the ward in good condition. Postoperatively the patient received 1500 roentgen units through each of four portals, anteriorly and posteriorly, and 1000 units through each of two portals laterally. At the termination of the x-ray therapy the mass had reduced remarkably in size so that it could barely be seen by x-ray and fluoroscopy. Repeat x-ray films were taken 5 weeks following x-ray treatment, and there was no evidence whatsoever of an anterior mediastinal tumor. Follow up at the end of 1 year shows the patient still asymptomatic, and roentgenograms are negative. The pathological report showed large cells with abundant acidophilic cytoplasm. Nuclei varied markedly in size and shape, but in general were round to oval with distinct nuclear membrane, and somewhat vesicular nucleus. Mitotic figures were occasionally seen. Cells were arranged in small groups separated by narrow strips of hyaline tissue forming a definite trabecular outline. Diagnosis: carcinoma, thymic. (Figs. 52 to 55)

Thymic cyst Cystic disease of the thymus is an extremely rare entity in adults. A few cases are reported in infants most of them are believed to be secondary to congenital syphilis. Ribbert believed that the thymus consists of a series of epithelial channels, their development being arrested by syphilis which caused the "Dubois abscess" or cyst formation. Chlan agreed with Ribbert's theory but felt

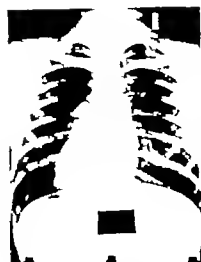


Fig. 56



Fig. 57



Fig. 58



Fig. 59

Fig. 56 Preoperative roentgenogram. Case 32
Fig. 57 Gross specimen intact

Fig. 58 Gross specimen opened
Fig. 59 Showing thymic tissue and cyst wall

that syphilis was not the only etiologic factor.

Previous descriptions of thymic cysts in adults have been limited to small lesions found at autopsy. One case presented by Kopac (also an autopsy specimen) described a left thymus lobe entirely replaced by a cluster of grape-like cysts. This specimen is similar to our case except his cysts were separate from one another and involved only one lobe of the gland. Kopac summarized the morphogenesis as follows: The first step in cyst formation is the degeneration and necrosis of the parenchyma in the medullary substance. There is a much greater deterioration of the blood vessels than the degree of involution of the thymus could explain. In these necrotic spaces fluid accumulation takes place. The surrounding reticulum cell assumes a flattened appearance and form an epithelial layer through which the entire picture assumes appearance of a cyst wall. The cyst increases at the expense of the surrounding parenchyma. As the Strandberg layer is reached by the cyst the cyst acquires a connective tissue wall. The parenchyma which surrounds the cystic cavities is formed by the cortical substance.

We are presenting a thymic cyst in an adult which completely replaces the gland; is not due to syphilis; and is apparently the first cyst of its type and size to be successfully removed.

CASE 32 T. C. A. Jr. This 22-year-old white male was admitted to this hospital for minor lumbago of his right shoulder and chest. Physical examination was essentially negative except for the minor hurns which were treated and healed uneventfully. Routine roentgenogram of the chest showed a well-defined of the superior mediastinum. Comparison with roentgenograms taken 3 months previously showed that the mass was present at that time although much smaller. Bronchoscopy was negative. Further roentgenographic studies showed a lobulated mass in the anterior mediastinum. Thoracotomy was performed through a posterolateral incision and a multiloculated anterior mediastinal cyst was removed. Postoperative course was uneventful. Pathological report showed an inverted V-shaped multicystic tumor weighing 74 grams without fluid content. Filled with 150 cubic centimeters of water, it weighed 240 gram. The specimen was bilobed, one lobe measuring 14 by 2 1/2 by 5 centimeters and the other lobe measuring 12 by 5 by 7 1/2 centimeters. Microscopic sections showed that this was definitely a polycystic and multicystic thymus. Abundant thymic lobules were still visible in various portions of the walls of the cystic lobes. In the thymic tissue Hassall's corpuscles were seen with occasional giant cell and xanthoma cell present. There appeared to be a periphery of the epithelial ramifying transitional thymus. Cystic degeneration occurred in these. Diagnosis: polycystic thymus (Figs. 56 to 59).

PRIMARY TUMORS OF LYMPH NODES

The only characteristic feature of this group of tumors is that they frequently involve only a single group of nodes in the early stages. This fact is important in a discussion of medi-

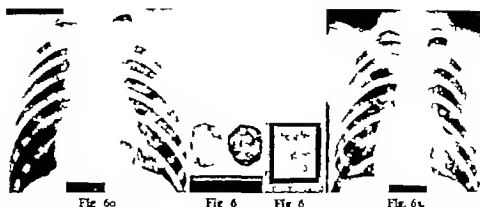


Fig. 60. Preoperative roentgenogram. Case 33.

Fig. 61. Gross specimen.

Fig. 62. Showing Reed-cell and marked fibrous thick-

is replacing the lymphoid and plasma cell elements.

Fig. 63. Postoperative and post-radiation roentgenogram.

astinal tumors because that may be the only site where the disease is found. If the disease is generalized, peripheral node biopsy may establish the diagnosis. When mediastinal nodes are the only positive findings, we believe it imperative that mediastinal biopsy be performed not for medical curiosity, but for aid in planning intelligent therapy and to ascertain prognosis. The mortality of mediastinal exploration is no greater than that of abdominal exploration (44) and some of us believe that morbidity is even less.

Lymphosarcomas. Ewing classifies lymphosarcomas into two groups: (1) reticulum cell sarcoma, (2) malignant lymphocytoma. Although histologically different, the two types are considered as one for clinical purposes. Lymphosarcoma is most often found in a definite chain of lymph nodes and from there becomes a generalized disease. Primary sites, in order of frequency, are cervical, mediastinal, retroperitoneal and mesenteric nodes. In the mediastinal type the bronchial nodes may be involved with extensions to pericardium or pleura or lung with marked pulmonary symptoms (Ewing). Extirpation may be hazardous, but at least the attempt should be made because the results from x-ray therapy have been palliative at best. Even with surgical removal, recurrence is the rule.

Hodgkin's disease. In their excellent monograph on this subject, Jackson and Parker showed mediastinal or hilar nodes to be involved in 52 per cent of their 174 cases of Hodgkin's granuloma, with one third of the

cases of Hodgkin's sarcoma showing involvement. It is to be noted that in their 90 cases of granuloma and 10 cases of sarcoma, only 1 case showed mediastinal involvement, with no peripheral lesions. This point is emphasized because in the past a favorite objection to mediastinal exploration was that the lesion may be Hodgkin's. We have treated 15 patients with Hodgkin's during the past year, all with pathologic diagnoses, and in only 2 was it necessary to resort to mediastinal biopsy. One abstract follows:

CASE 33 C. L. B. This 20-year-old white male had complaints of weight loss and malaise 6 months previous to admission. At the onset of his complaints, biopsy had been taken from a palpable node in the right inguinal region, and the pathological report was negative. Roentgenograms of the chest at onset of complaints showed an enlargement of the mediastinum, type undetermined. At time of admission to this hospital, complaints were minimal. Physical examination was negative. Laboratory studies were within normal limits with the exception of the roentgenogram which showed a diffuse enlargement of the superior mediastinum. Test doses of x-ray therapy showed response to the treatment, and a full course of deep x-ray was given to the mediastinum. Patient was discharged and returned in 3 months, at which time a palpable node was found in the left axilla. Biopsy of this node was performed and a pathological report again was negative. He was discharged again for 30 days, and on return the x-ray films of the chest showed nodular widening of the mediastinum on the left at the level of the first rib anteriorly and also just superior to the left hilum with increase in size in the past 5 months. Mediastinal exploration, as performed with uneventful recovery. Pathological diagnosis: Hodgkin's disease, lymphogranuloma type, mediastinal node left (Figs. 60-63).

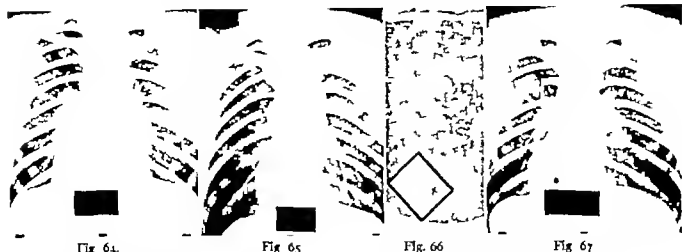


Fig. 64.

Fig. 65

Fig. 66

Fig. 67

Fig. 64. Admission roentgenogram. Case 34.

Fig. 65. After test dose² of x-ray therapy

Fig. 66. Photomicrograph showing epithelioid tubercle.

Fig. 67. Postoperative roentgenogram.

Boeck's sarcoid The mediastinal manifestations of this little known disease frequently simulate the tumors already discussed. Boeck's sarcoid is a pitfall in the common practice of using a test dose of deep x-ray therapy to establish the diagnosis of malignant lymphoma. Riesner (1944) states that over 85 per cent of 35 cases showed mediastinal node involvement and that 6 of these cases showed practically complete disappearance of the shadows while being watched; half of the total showed some regression. Certainly a test dose of x-ray during this regression period would lead to an erroneous diagnosis of lymphoma.

We have 4 cases to present—all were seen in a recent 6 week period. All had extensive medical work up and were referred to the Tumor Service as mediastinal tumor type undetermined. Each one shows a specific point of interest. The first 2 had mediastinal involvement with no palpable peripheral nodes; the third had only one peripheral node found deep in the cervical triangle after repeated careful examinations over a 3 month period (he also had uveoparotid involvement—Mikulicz's disease—since early childhood) and the fourth showing regression of mediastinal involvement to normal over a 5 month period. All cases were proved by biopsy: the first 2 by mediastinal nodes; the second 2 by peripheral nodes.

CASE 34. E. K. C. This 24 year old white male was admitted with a diagnosis of Hodgkin's disease.

He had slight chest pain on the left with occasional cough and a weight loss of 20 pounds in 9 months. Physical examination was essentially negative. Laboratory studies were within normal limits. Exploratory thoracotomy showed multiple nodes in the mediastinum and a biopsy showed Boeck's sarcoid. Recovery from surgery was uneventful. (Figs 64 to 67.)

CASE 35. D. C. R. This 19 year old colored male was admitted to this hospital with a diagnosis of Hodgkin's disease. A routine roentgenogram disclosed mediastinal masses and a diagnosis was made without biopsy. Physical examination on admission was negative. Laboratory studies were within normal limits with the exception of roentgenograms which showed moderate, bilateral hilar and superior right mediastinal adenopathy consistent with lymphoblastoma. Exploratory thoracotomy revealed multiple mediastinal masses and biopsy was made. Recovery from the operation was uneventful except for moderate superficial infection of the wound which responded to conservative therapy. Pathological diagnosis was reported as sarcoid (Boeck's) generalized.

CASE 36. F. A. N. This 27 year old colored male had intermittent dull pain in his right chest with cough and slight amounts of mucopurulent sputum of 1 year's duration. There was a weight loss from 150 pounds to 106 pounds. Roentgenogram of the chest showed a 2 by 5 centimeter mass lying just to the right of the tracheal shadow just above the right main bronchus. There was no evidence of pulsation, and it did not encroach on the esophagus. Physical examination was negative except for a single palpable lymph node in the left axilla. Laboratory studies were negative. Biopsy of the left axillary node showed sarcoidosis, lymph node axillary left.

CASE 37. J. L. This 25 year old colored male had a nonproductive cough, fatigue, hoarseness, and pain in the left anterior chest of 4 months duration. He was admitted to this hospital with a diagnosis of lymphoma malignant of mediastinum. Physical

examination was essentially negative with the exception of a single palpable node in a deep cervical chain on the right and enlargement of the uveoparotid glands, bilaterally. Laboratory studies were within normal limits. Biopsy of the cervical node showed sarcoid lymph node neck right.

Endotheliomas This is a rare type of primary tumor of the lymph nodes affecting either one node or a group of nodes but usually progressing to a systemic type of disease. Even when locally removable, it is a recurring malignant tumor. Histologically it is confused with secondary carcinoma.

PRIMARY AND SECONDARY SARCOMAS

The connective tissue tumors and the neurogenic tumors already mentioned may degenerate to form primary mediastinal sarcomas notably the fibromas, xanthomas, chondromas, and neurofibromas. Any of the connective tissue in the mediastinum may be the site of sarcomatous growth. Unfortunately there is no way to distinguish between the benign mediastinal tumors and the malignant on x-ray examination. Total removal is possible in early cases and metastasis is usually late.

Secondary sarcomas of the mediastinum are extremely rare as hematogenous spread is more frequent therefore involving the lungs before the mediastinum.

PRIMARY AND SECONDARY CARCINOMAS

The most frequent origin of primary carcinoma of the mediastinum is the thymus although many times the primary site cannot be determined due to the extent of the lesion. Primary sarcomas are three to four times as frequent as primary carcinomas. Surgical intervention offers no hope as the lesion is asymptomatic in the early stages and the mediastinal contents are extensively involved by the time exploration is sought. X-ray therapy is palliative in a few cases but the most effective treatment is section of sensory nerve roots to allay pain.

Secondary carcinomas of the mediastinum usually come from lung, esophagus, or breast and occasionally from abdominal viscera. Treatment is purely palliative.

CASE 38. V. L. G. This 39 year old white male had recurrent episodes of pain between the shoulder

blades of 4 months duration. The pain was deep seated, and continuous, being relieved only by leaning up against something. Examination revealed a cyanotic dyspneic, well developed, young male. Thorax was symmetrical and expansion unequal. There was supraclavicular and infraclavicular retraction on inspiration. There were real varicosities over the anterior chest. Resonance was impaired at the right base, and breath sounds were diminished in both bases. There were healed blow wounds in both axillae. The rest of the physical examination was negative. Roentgenograms of the chest revealed a marked widening of the mediastinal shadow with some evidence of mild atelectatic changes in the lower lobe on the left. Patient received a diagnostic test dose of x-ray therapy over the mediastinum with no evidence of regression of the tumor mass. An anterior mediastinotomy was performed which showed a large tumor mass in the anterior mediastinum which could not be removed. Biopsy was taken. Recovery from the operation was uneventful but the patient continued to lose weight and strength in spite of heavy doses of x-ray therapy over the mediastinum. His course was progressively downhill, and he expired 38 days following surgery. Pathological report: carcinoma, anaplastic, mediastinum.

CASE 39. W. A. H. This 38 year old, late male had a routine chest roentgenogram 6 months previous to admission which was said to be negative. One month later a second routine chest plate was taken and a small tumor mass was found to the right of the midline in the mediastinum. Comparison with the previous film showed a small mass present at that time. During the subsequent 5 months, he was carefully observed with repeated roentgenograms which showed progressive enlargement of the tumor mass. After the fourth month a trial dose of x-ray therapy was given which was reported as being inconclusive. The patient was transferred to this hospital 6 months after his first roentgenogram in markedly poor condition. He was complaining of mild pain in the right chest, marked weakness, and dyspnea. Physical examination showed marked weight loss and complete dullness to percussion over the entire anterior right chest extending into the axilla and into the right base posteriorly. There was complete absence of breath sounds in this area. There were a few breath sounds coming through over the right chest posteriorly at the apex. Left lung was negative to physical examination. Laboratory studies were within normal limits except for a red count of 4,000,000 and a hemoglobin of 75 per cent and the roentgen studies which showed a fairly well delineated mass in the right hemithorax apparently originating in the anterior mediastinum and extending laterally resulting in a compression of the right lung and shift of the heart shadow toward the left. Review of the old films showed a 5 millimeter mediastinal mass barely projecting into the right hemithorax present 6 months previous to admission. The x-ray diagnosis was a mass of malignant nature, and from its location thymic origin was considered.



Fig. 68.



Fig. 69.



Fig. 70.

Fig. 68. Six months previous to admission. Note right hilar mass. Case 39.

Fig. 69. Two months previous to admission.

Fig. 70. Admission roentgenogram.

Fig. 71. Autopsy specimen showing extent of pulmonary infiltration.



Fig. 71.

Exploratory thoracotomy was performed and an extremely large mass was seen markedly adherent to the right lung and compressing it posteriorly. The mass was entered and found to consist of a moderately thick cyst wall with a tremendous amount of organized hematoma in the center. The hematoma was evacuated from the mass and no bleeding points were found. A section of the wall was taken for biopsy. Thorax was closed, and the patient was returned to the ward in poor condition. Pathological report showed a papillary carcinoma. However, there was a suggestion of endothelial origin, original site undetermined. Patient required numerous thoracenteses to remove the large collection of fluid formed postoperatively. The reaction from x ray therapy was too severe, so that he received only a few hundred roentgen units over the anterior mediastinum. Death occurred 2 months after surgery (Figs 68 to 71).

CASE 40 P T. This 51 year old colored male had a persistent cough of 13 years duration. Ten years previous to admission he expectorated blood for 1 week. He had recurrence again 2 years previous to admission, and 1 year previous to admission, each attack lasting for about 1 week. Four months pre-

vious to admission, he had marked weight loss, malaise, and left chest pain, so he was seen by a physician who took chest roentgenograms and told him he had no trouble, so he returned to work. His disabilities continued to grow more severe. Finally a second roentgenogram was taken 4 months after the onset of acute symptoms and he was referred to this hospital with a diagnosis of mediastinal tumor, type undetermined. Physical examination was essentially negative except for moderate weight loss. Laboratory studies were within normal limits except for the roentgenogram of the chest which showed moderate nodular mediastinal enlargement. Thoracotomy was performed with removal of a mediastinal lymph node for biopsy. Recovery from thoracotomy was uneventful. Pathological report on the biopsy revealed anaplastic carcinoma, original site undetermined. Postoperatively he received 1400 roentgen units to each of four portals, two anteriorly and two posteriorly with complete remission of symptoms. He was discharged for 1 month at which time a second course of x ray therapy was given, bringing the total roentgen units to 2150 over each of the four portals. On his third admission 1 month after discontinuance of the second course of treatment he was given a



Fig. 7



Fig. 73

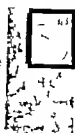


Fig. 74



Fig. 75

Fig. 7. Preoperative roentgenogram. Case 41.

Fig. 73. Gross specimen, a roughly spherical mass, 5.5 centimeters in diameter.

Fig. 74. Showing colloid-like follicle and rosette-like tubules.

Fig. 75. Postoperative roentgenogram.

third course which consisted of 2,400 roentgen units over each of two lateral portals. Until this time the patient had been feeling well—at least holding his own except for a single episode of pain directly in the wound, and on palpation a single nodule was found lying in the skin. This nodule was removed local anesthesia being used and the pathological report showed anaplastic carcinoma the same type that was removed from the mediastinum. Apparently there had been seeding of the carcinoma into the skin at the time of the original biopsy. Recovery from this minor surgery was uneventful with no recurrence in the wound. Following the third course of x ray therapy patient gradually began to fail, complaining of pain over his left chest and left shoulder. He had marked weight loss, and roentgenograms showed a diffuse density in the lower two-thirds of the left lung field. The patient expired 7 months after mediastinal biopsy. Autopsy showed the carcinoma still confined to the mediastinum with postirradiation fibrosis and bronchopneumonia at the base of both lungs.

INTRATHORACIC GOITERS

This group of mediastinal tumors is mentioned merely for differential diagnostic purposes. Several goiters in the mediastinum with no connection with the thyroid have been reported. Mason's was located in the posterior mediastinum and was successfully removed by extrapleural mediastinotomy. We have 1 case of mediastinal goiter with no connection with the thyroid. It was located between the bifurcation of the trachea and the base of the heart extending laterally into the right thorax.

History was completely negative. Physical examination was within normal limits. Laboratory studies were negative except for roentgenograms which showed an ovoid 6 centimeter mass, lying attached to the pericardium in the region of the junction of the right ventricle and right atrium. The x ray diagnosis was probable pericardial cyst. Thoracotomy was performed and the mediastinal mass was removed. It was lying anterior to the pericardium, and extending upward in the mediastinum to the bifurcation of the trachea. Recovery from operation was uneventful. Pathological report showed a roughly spherical mass measuring 5.5 centimeters in diameter with an attached mass measuring 5 by 3½ centimeters in diameter. On cutting the specimen, considerable turbid old blood exuded under pressure. The large space was filled with friable yellowish-gray fibrin. Attached tumor structure was multiloculated and contained clear straw colored fluid. The tumor was composed of glaucous gray tissue. On section of the cyst wall, there was an area of thymic tissue closely associated with fibrous capsule. Extending over the thymic tissue and extending into the cyst was an adenomatous structure with very small rosette-like tubule, and as the cavity of the cyst was approached, these tubules became larger forming increasingly larger follicle-containing colloid material. Cells were regular in size and shape with large round nuclei with finely distributed chromatin. The cytoplasm was poorly discerned, but granular and appeared to have a secretory function. No mitotic figures were noted or evidence of manifest malignant change. The tumor was considered to be a benign aberrant thyroid tissue having no connection with the normal thyroid gland and lying completely within the anterior mediastinum (Figs. 72-75).

SUMMARY

CASE 41. I. O. S. This 24 year old white female had a routine chest roentgenogram which showed a

1. A classification of mediastinal tumors is presented

2 The various types of tumors are discussed under separate headings.

3 Emphasis is placed on the importance of thoracotomy for pathological diagnosis with extirpation of the mass if it is operable. Evidence is presented to show that thoracotomy is a safe rational procedure with no mortality in properly selected cases.

4 Thirty five mediastinal cysts and tumors are presented with six additional cases of differential diagnostic conditions

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A TECHNIQUE FOR PORTACAVAL ANASTOMOSIS (ECK FISTULA)

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THE recent reports of Whipple and of Blakemore and Lord (2) of their experiences in the treatment of patients with portal system hypertension by means of venous shunt operations have created renewed interest in a type of surgery which should be given a trial in these patients whose lives are constantly threatened by massive hemorrhages from the gastrointestinal tract. Whipple's lucid article and Blakemore's (1) subsequent report of the results in 25 operations point out the problem, the indications for these operations, and the results that have been obtained to date by the group working at the Presbyterian Hospital. Knowledge of this subject has come largely from these workers.

Two operations splenic renal vein anastomosis and portal vein inferior vena cava anastomosis, have proved most useful in decompressing the portal system. When portal hypertension exists, pressure readings in this system are frequently 3 to 5 times greater than normal. Everyone is familiar with the routes of collateral circulation which develop naturally by the enlarging of normally small venous communications in an attempt to circumvent portal venous obstruction. Esophageal varices frequently develop and it is the rupture of such varices that produces alarming hemorrhage. In addition to this hemorrhage factor ascites may develop in part at least on the basis of portal hypertension although the state of liver function is probably a more important factor in most cases of liver cirrhosis. It can be easily seen that a successful anastomosis of a portal system in which the pressure is in the neighborhood of 400 millimeters of water to a systemic venous system whose pressure may range from 40 to 80 millimeters of water should greatly relieve the hazard of these two complications of portal hypertension. Whether

spleno-renal anastomosis or portacaval anastomosis should be used in a given instance depends upon the site of obstruction. In general when both can be used as is true in the intrahepatic bed block of liver cirrhosis, the larger portacaval shunt is to be preferred.

While my own experience with Eck fistula operations is limited, in this communication I wish to describe a method of portacaval shunt which I have used in a patient whose case report follows. The technique to be described avoids complete caval obstruction and is technically not too difficult. Blalock (3) has said that it is not necessary to occlude the vena cava completely during this operation but has not described the method he uses. An early operation in 1913 reported by Rosenstam was performed as a side to-side anastomosis with intermittent caval occlusion. Complete caval obstruction was the complicating factor in other early operations (5).

An end-to-side anastomosis of the portal vein to the inferior vena cava was performed above the renal veins and the anatomical result may be seen in Figure 1a. Dissection of the hepatic pedicle and the isolation of the portal vein is time consuming. The essentially important features of this anastomosis are two. In Figure 1b it can be seen that the vena cava is never completely obstructed a free flow of caval blood can pass beneath the clamp which has temporarily isolated a portion of the wide cava. The clamp used is the ordinary Thomas Smith intestinal forcep which has been used for years in the operation of anterior resection of the rectum. It has spring blades and does not injure the tissue. For emergency use, loops of umbilical tape are placed above and below the clamp. The second feature of the anastomosis is the method of suture. The evertting suture described by Blalock (4) has been employed in a medial and lateral row as shown in Figure 1c. After completion of the anastomosis and removal of

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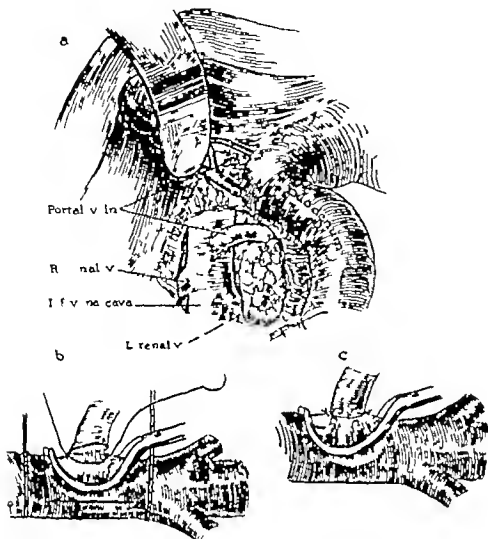


Fig. 1. a, Completed suture portacaval anastomosis. b, Anastomosis of the end of the portal vein to the side of the vena cava above the renal vein entrances with the Thomas Smith clamp in place. Note free caval flow beneath the clamp. c, Anastomosis completed. Note everted type of suture.

the clamp one small leak was found which was controlled with one interrupted suture. Three zero Deknatel suture was used.

This method of anastomosis has the advantage of not obstructing the vena cava. It can therefore be done almost at leisure. The Blakemore method of nonsuture anastomosis with a vitallium cup which is placed on the end of the portal vein and later secured into the side of the cava by pursestring sutures requires that the cava be obstructed during this maneuver. Complete obstruction of the inferior vena cava, so well tolerated below the renals, can only be borne with safety above the renal veins for an estimated 10 minute period. Longer obstruction incurs serious kidney damage with resulting anuria. On one

occasion I have shut off the vena cava for too long a time in order to repair a rent in this vessel caused by attempting to pursestring a vitallium tubed portal vein. Death with anuria resulted 5 days after operation. This important time factor in methods which require caval obstruction can be avoided by the method described. Another advantage of this suture method is in its preservation of the full length of the portal vein after its severance close to the liver. Cuffing of the vein over a vitallium tube loses a valuable half inch of this vessel.

The theoretical disadvantage of suture anastomosis is concerned with intravascular clotting at the anastomosis with exposed sutures as the precipitating factor. The non

suture anastomosis is supposed to avoid this contingency. The pressure differential however between the portal system and the vena cava should avoid this complication since there is effected a shunt lesser but similar to an arteriovenous communication. These latter fistulas are in the normal course of events very liable to keep open.

It is quite probable that the clamp method of anastomosis described cannot be applied in all cases. When it can however it will be found I believe to be technically less difficult and less dangerous. The Blakemore tube method on the other hand has been found to be very satisfactory for the group working with this method who have developed great skill in the technique. This type of suture technique, I present as an alternative method

CASE REPORT

Portacaval anastomosis for portal hypertension caused by intrahepatic portal bed block (cirrhosis of the liver)

H.L., a young man 24 years of age was referred by Dr. William Moloney who had attended him for some time for severe gastrointestinal hemorrhages from oesophageal varices, the result of hepatic cirrhosis.

In April of 1944 while in the service, this patient began to complain of weakness, dizziness, and lassitude with occasional fainting spells. These may be interpreted as probably the result of an anemia. On one occasion he fell off a gun emplacement and was hospitalized with a questionable diagnosis of head injury. In November of 1944, while an Army Hospital patient, he had his first severe gastrointestinal hemorrhage. There was a large loss of blood requiring several transfusions. A diagnosis of splenomegaly with Banti's syndrome was made and in April, 1945 a splenectomy was performed at the Cushing General Hospital. The patient was subsequently discharged from the service on certificate of disability. In December of 1945 about 8 months after splenectomy he was admitted to the Carney Hospital with another exsanguinating hemorrhage. This

episode was treated by transfusions of blood. Two other hemorrhages occurred before his admission in January of 1945 for study and operation.

On this admission he was found to be in good general health. Physical examination revealed only a slight enlargement of the liver and a healed left abdominal splenectomy wound. There was a mild anemia, the red blood count numbered 3,400,000 per cubic millimeter of blood and the hemoglobin value was 75 per cent. White blood count was 9,100 with a normal differential count. Liver function tests showed good function. Total protein measured 6.7 grams per 100 cubic centimeters of serum with 4.0 grams of albumin and 2.7 of globulin. There was a 15 per cent retention of bromsulphalein in 3/4 hour with 10 per cent in 1 hour. Cephalin flocculation test was reported as 2+ the total cholesterol value was 160 milligrams per cent, cholesterol ester 100 milligrams, free cholesterol 60 milligrams. The boric acid excretion test was reported as 4.3 grams of benzoic acid excreted in 4 hours. On roentgenologic examination the esophagus was widened and there were well marked varices. A diagnosis of intrahepatic portal bed block with hypertension was made.

On January 27 a portacaval anastomosis was made according to the method described. Cirrhosis of the liver was found and a liver biopsy secured. Portal vein pressure measured 400 milligrams of water at operation. The patient was hospitalized for 4 days. Postoperative complications included right lower lobe atelectasis, a wound hematoma, and an episode of partial intestinal obstruction, none of which were alarmingly serious.

Since operation the patient has remained well and his liver function is being followed. It remains for time to elapse before an estimation can be made of the value of the operation in his case. Absence of hemorrhages in the future will be practical evidence of successful reduction of portal hypertension.

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TUMORS OF THE ISLETS OF LANGERHANS

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LANGERHANS in 1869 first described the pancreatic "islets" which now bear his name and Nicholls in 1902 observed an adenoma arising from these structures. Nevertheless it was the discovery of insulin (4) and its production by certain of the islet cells which led investigators to wonder about hypoglycemia resulting from hyperinsulinism with its possible relationship to islet cell hyperplasia. In 1924 Harris suggested that an excess of insulin in the blood might be brought about by the presence of a hyperfunctioning tumor of pancreatic islet cells. Three years later his prediction was fulfilled when Wilder and co-workers recorded the first instance of such a tumor. Even though their tumor was a carcinoma with hepatic metastasis a finding in itself unusual they were able to demonstrate by biochemical means that the cells although undifferentiated elaborated insulin in large amounts. Since 1927 an increasing number of publications dealing with benign and malignant neoplasia of this type has evidenced a lively interest in the subject. The past 15 years have witnessed in this regard the development of many refinements of clinical and laboratory diagnosis. Surgeons through accumulated experiences have learned how and where to search for islet cell tumors, which are frequently small and often multiple. Pathologists have contributed their share of knowledge in the matter of employing special stains (22-24) which have unveiled the important rôle of the so called beta cells in the production of insulin by normal and neoplastic islet cells. They have failed however to help their clinical colleagues in the problem of establishing microscopic criteria of 'malignancy' in functioning pancreatic tumors.

Feeling that in the case of such a rare lesion the analysis of a large series might shed some light on the malignant potentialities of islet cell neoplasms we undertook comprehensive study of the problem with our prime interest centered on the histopathologic aspects.

MATERIALS AND METHODS

In the 20 years preceding September 1945 there have been observed at the Mayo Clinic 38 patients who presented the syndrome of spontaneous hypoglycemia on the basis of pancreatic islet cell tumors confirmed at operation or at necropsy. This group of cases constituted the nucleus for the present report.

With the aim of ascertaining the incidence of islet cell tumors the records of 10,314 consecutive necropsies from the Section on Pathologic Anatomy were studied. These records revealed a total of 44 tumors which had been discovered by routine methods of examining the pancreas. Eight of these tumors were functioning and accordingly are listed in the aforementioned group.

For the third phase of our study we are indebted to Dr. Pease of the Section on Pathologic Anatomy who furnished us with the results of her careful review of 500 consecutive pancreases studied at necropsy. The material from two pea sized and six microscopic adenomas was thus added to our series in a demonstration of what actually approximates the incidence of these tumors.

With a view to studying the relative number the limits of size and the staining properties of islet cells a number of pancreases were secured at the necropsy table and blocks were taken from various portions. This part of the study was especially helpful in the interpretation of the results of special staining methods outlined in later paragraphs.

From all of these tissues single or multiple blocks were selected so as to include when possible the junction of normal and neoplastic material. When the specimen was surgical

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and fresh, portions were placed in 10 per cent formalin and in Bouin's fluid the former being suitable for routine hematoxylin and eosin stain and the latter for the chromium hematoxylin phloxine stain as recommended by Gomori (22). Older specimens had been fixed in formalin. Blocks cut from these were placed in bottles containing fresh formalin and studied from Mallory, Heidenhain stain preparations. In a few cases in which a stain was desired to demarcate clearly acinar from islet tissue the phosphotungstic acid hematoxylin staining method of Mallory was employed.

CLASSIFICATION

From a careful review of the literature correlated with a study of our slides of pathologic tissue and a subsequent appraisal of the clinical records of our cases it became apparent that the tumors could be divided conveniently into the following groups: (1) adenomas of islet cells without hypoglycemia; (2) adenomas of islet cells with hyperinsulinism; (3) metastasizing carcinomas of islet cells without hypoglycemia; (4) metastasizing carcinomas of islet cells with hyperinsulinism; (5) borderline malignant islet cell tumors with or without hyperinsulinism. Subsequent paragraphs will deal with the clinical and pathologic aspects of these individual groups and include followup studies on the surgical cases up to but not including September 1945. However as a prelude to presenting the rather complex histopathologic aspects of the tumors we find it convenient at this point to review briefly our present knowledge of the normal histologic characteristics of the pancreatic islets of Langerhans particularly as elucidated by the use of newer methods of staining.

HISTOCYTOLOGIC ASPECTS OF PANCREATIC ISLETS

Under the low power objective of the microscope in sections of pancreas stained with hematoxylin and eosin the islets of Langerhans usually stand out as circumscribed, pale, round or irregularly shaped nests varying in size from 25 to 500 microns. Their total number has been variously estimated, 500,000 per pancreas representing a fair average. Their greatest concentration appears to occur in the

tail and body of the pancreas, two locations in which the highest incidence of islet cell tumors is also found. Although the islets of Langerhans are fairly well demarcated from the surrounding acini and ducts, no intervening connective tissue capsule, in the true sense of the word, exists and acini and islet cells appear in close apposition. This fact is not surprising when we consider that the islets are formed from ducts (1) although the process, according to most investigators, is normally prenatal (2).

As seen in hematoxylin and eosin preparations using the high power objective, the islets are composed of small, pale, cuboidal, low columnar or wedge-shaped cells disposed in the form of ribbon like strands, short cords or alveolar groupings, occurring in pure or mixed pattern forms. These cellular aggregations are separated by fine anastomosing capillary blood channels and the vascularity of the islets stands out in striking contrast to the relatively 'bloodless' condition of the surrounding acinar tissue. The blood vessels are accompanied by a certain amount of reticular and fine collagenous connective fibers which impart to the islets large and small degrees of lobulation. The thin basement membranes of adjacent ducts and acini along with the endothelium of small blood vessels and the occasional small connective tissue fibers line the islands peripherally and represent the only suggestion of a capsule as seen in our own and other studies.

Individual islet cells were small and of uniform size each contained a small, round to oval, centrally placed nucleus poor in chromatin and an investing ring of fairly clear cytoplasm. A lack of zymogen granulation and chromidial substance contrasted the pallor of the islet cells with the darker appearance of the surrounding parenchymatous elements. Intimate contact of certain groups of islet cells with sympathetic ganglion cells was observed and Gomori (23) has expressed the belief that these represent special chemoreceptors concerned with the regulation of insulin. As seen in preparations using the Mallory Heidenhain stain the cytoplasm of islet cells was finely granular. In 60 to 80 per cent of the cells the granules were grayish orange. These were the beta cells, the cells concerned, according to

available experimental and pathologic evidence (13) with the metabolism of carbohydrates. In other words these "beta granules" may be the morphologic expression of insulin content. They are insoluble in water but soluble in alcohol, a matter important in selecting a fixative for studies of pancreatic tissue. Twenty to forty per cent of the cells showed the presence of ruby red granulations identifying these cells as the alpha cells of Lane and Bensley. These granules are somewhat soluble in water but they can usually be demonstrated in material fixed in formalin. Remaining cells take a sky blue stain and represent the so called D cells.

In fresh tissue fixed with Bouin's fluid and stained with the Gomori (22) chromium hematoxylin-phloxine stain, beta granules appeared dark blue in sharp contrast to the red color of the alpha cell granulations. D cells could not be differentiated from alpha cells by this method.

Mallory's phosphotungstic acid hematoxylin stain colored alpha granules steel blue but did not bring out the beta granulations. However, inasmuch as it colored the zymogen granules of the pancreatic acini a deep blue-black or purple, it facilitated the distinction between acini and islets. It afforded also a means of studying postnatal acinar origin of pancreatic islets. Our investigation by this method did not show cells containing both zymogenic and specific islet cell granulations. Postnatal formation of islets from pancreatic ducts is conceded by many investigators.

Using these and other methods of differential staining, wide variations were encountered in the numerical proportions of the various cellular types in the islets and the density of the granulations. Even in presumably normal material, margination of granulations and even degranulation were commonly observed. Some of these aberrations represent artefacts based on postmortem autolysis. For the best histologic results, employment of perfectly fresh tissue is essential.

ISLET CELL ADENOMAS WITHOUT KNOWN HYPOGLYCEMIA

In a consecutive series of 10314 necropsies in which the pancreas was made available for

study in 36 cases the presence of one or more clinically silent adenomas of the islets of Langerhans and in 8 cases the presence of 'functioning' adenomas was demonstrated. This incidence of 1 in 234 necropsies represents the 'routine' average and is considerably lower than the figure cited by Pease, whose 500 consecutive cases yielded 8 solitary non-functioning adenomas as a result of a carefully conducted gross and microscopic search for their presence. Twenty-four of the 44 subjects¹ were men and 20 were women. The ages of the patients at the time of death ranged from 27 to 85 years. 91 per cent being more than 50 years of age. Causes of death were varied. Coronary sclerosis and gastrointestinal carcinoma led the list, with no definite clinical or pathologic evidence that hyperinsulinism played even a terminal rôle. Interestingly enough, in 3 of the cases the islet cell tumors developed in spite of the existence of clinical diabetes mellitus.

In these 44 cases there was a total of 52 tumors, 38 being localized in the tail of the pancreas, 3 at the junction of body and tail, 2 in the body proper, and 9 in the head of the gland. In 35 cases the tumors were single, in 8 2 separate adenomas were present, and in 1 the neoplastic process appeared to be truly multicentric—a sort of adenomatosis. In 5 of the 8 cases of 'double tumors' the neoplasms were in close proximity, one to another. In 3 instances the tumors were widely separated.

The diameters of the tumors varied from 1 millimeter to 1.5 centimeters, with an average of 5 millimeters. Only 3 specimens exceeded 1 centimeter in diameter. Grossly the tumors appeared to be encapsulated and sharply demarcated from the surrounding acinar tissue, although separation could rarely be accomplished along a clear plane of cleavage. As compared with the adjacent tissue the color did not contrast so markedly as did the texture of the cut surface, in which the gross lobulation so characteristic of pancreatic parenchyma, was replaced by a smooth homogeneity striking in all islet cell tumors examined in this group.

Histologic features of these 52 adenomas were essentially similar to those detailed for

¹Thirty-six, plus 8 who had nonfunctioning adenomas.

the 'functioning' group of tumors in a subsequent section. Accordingly they will not be described here. Examination of surrounding pancreatic tissue revealed islet cell hyperplasia in 12 instances and proliferation of ducts in 4 cases. Acinar atrophy with fat replacement was noted on 5 occasions and an additional 3 cases showed interstitial fibrosis. In 1 case the phenomenon of squamous cell metaplasia of the pancreatic ducts was demonstrated.

ISLET CELL ADENOMAS WITH HYPERINSULINISM

In 1929 Roscoe Graham achieved the first surgical cure of hyperinsulinism when he successfully removed the causative islet cell adenoma (31). From 1929 to September 1945 we have found in the literature 99 additional and similar examples in which the same result was obtained. Thirty six other and somewhat similar cases are listed under 'personal communication' items and so forth but the data supplied were not sufficient to permit of comparative analysis. A further group of 25 functioning islet cell adenomas has been reported from necropsy studies over the same period.

At the Mayo Clinic from 1927 to September 1945 in 19 cases a diagnosis of clinical hyperinsulinism was based on the presence of benign islet cell tumors which were successfully removed at operation (12 25 36 37 46 55)¹. In 2 additional cases the tumor could not be located at operation and was discovered only after careful search at necropsy. In still another case there existed a condition of diffuse islet cell adenomatosis which was only partially relieved by subtotal pancreatectomy. Thirteen of the patients were female and 9 were male. Their ages ranged from 9½ to 68 years with an average of 41.5 years and with two thirds of the patients listed in the fifth and sixth decades. Symptoms referable to hyperinsulinism had existed for periods varying from 2 months to 18 years. Twelve patients had had trouble for at least 5 years and 5 dated back the onset of their symptoms to periods of more than 10 years. The minimal blood sugar level² was less than 50 milligrams per 100 cubic centimeters in 20 of the 22 cases

and in 16 it was less than 40 milligrams. A minimum of 20 milligrams was recorded in 1 case. The blood sugar level did not reflect any information as to the clinical duration of the trouble.

In 12 of the 22 cases the tumor was more or less easily identified by the surgeon and removed by simple excision. In 3 cases surgical removal of the body and tail of the pancreas was carried out with the hope that the zone of tissue removed included the causative tumor, which were not palpable at operation. In 1 instance this procedure was successful, a small adenoma being found by the surgical pathologist. In the other 2 cases reoperation was necessary the adenoma being found and excised locally in one. In the other case the surgical pathologist made the discovery of a small tumor deeply embedded in a resected portion of the head of the pancreas (Fig 1). In 1 instance total pancreatectomy was resorted to because of undoubted clinical evidence of tumor and the inability of the surgical pathologist to find the adenomas in successively removed portions located deep in the head, close to the duodenum. In 1 of our early cases death of the patient followed an exploratory operation with negative findings. An adenoma involving the head of the pancreas was discovered at necropsy. In another case material from 3 partial resections was devoid of adenomas and the patient continued to suffer from the effects of hyperinsulinism until his death 18 years after the last operation. At necropsy elsewhere an adenoma of accessory islet tissue was found near the duodenum. In 2 cases the surgeon resected suspicious tissue which was reported by the surgical pathologist as being 'negative' for tumor. Relief of symptoms prompted us to review the surgical material carefully. Adenomas measuring 2.5 and 4 millimeters in diameter respectively were found. These represent the smallest hyperfunctioning islet cell adenomas, with surgical cures on record. The twenty-second case was one in which multiple resections have been carried out for adenomatosis of the islets of Langerhans. Inasmuch as this case bears some resemblance to several of an unusual nature recorded in the literature (30, 40) a brief description is appended.

¹Seven of these cases have been reported in the literature by the "W" method.



Fig. Surgical specimen of resected pancreas showing an encapsulated benign islet cell tumor 0.8 centimeter in diameter located in the head. Benign tumors of this type are in general small and in consequence difficult to locate at the time of operation.

A 34 year old white woman had experienced for 11 years transitory episodes of diplopia, faintness, weakness and excessive perspiration. At first infrequent and mild with the progression of time these became frequent and severe. It had been noted that the attacks came on before meals and that they were relieved by the taking of food. Recently the attacks had been complicated by unconsciousness with urinary and fecal incontinence. In several of the attacks there had been convulsive twitchings.

Results of physical examination were essentially negative. Studies on blood sugar during an attack brought on by fasting showed a level of 36 milligrams per 100 cubic centimeters of blood. Determinations of calcium and phosphorus gave values of 13.1 milligrams and 2.0 milligrams per 100 cubic centimeters of serum respectively. In spite of negative roentgenologic evidence it was considered that the patient was suffering from hyperparathyroidism as well as hyperinsulinism. Following operation on September 24, 1943 for removal of a pancreatic adenoma there was transitory hyperglycemia. Soon thereafter the previous symptoms recurred and on April 4, 1944 the entire tail of the pancreas was removed for multiple small adenomas which had not been palpable at the time of the first operation. This second operation cured the hypoglycemic attacks and brought the blood sugar to normal levels as determined repeatedly over a subsequent period of 18 months.

In March 1945 the patient returned for consideration of her parathyroid status. Calcium levels at this time ranged from 12.5 to 13.8 milligrams per 100 cubic centimeters of serum, and phosphorus values varying from 1.9 to 2.5 milligrams per 100 cubic centimeters of serum were obtained. Studies on urinary

excretion of calcium while the intake of calcium was approximately 125 milligrams daily demonstrated a 'negative balance.' There was no evidence of renal calculi or of disease of bone. On March 22, 1945 a typical parathyroid adenoma measuring 2.5 by 1.5 by 0.5 centimeters was found and removed from the anatomic location of the left inferior parathyroid gland. Postoperatively no chemical improvement was noticed in the studies of the blood and at the present time the advisability of surgical exploration of the mediastinum is being considered to climax this most unusual story of probable multiple parathyroid tumors associated with pancreatic insular adenomatosis.

Pathologically the first pancreatic adenoma removed from this patient measured 1.5 centimeters in diameter, was well encapsulated and did not differ materially from others described in this series. Atypical beta like granules were found in abundance. The material from the second operation, on the other hand, showed large zones of pancreatic acinar tissue replaced by a multicentric nodular growth of atypical islet cells. These growths varied in size from microscopic dimensions to nodules 1.5 centimeters in diameter (Fig. 2). At least 8 of the nodules exceeded 1 centimeter in average diameter. Some of the smaller units resembled, microscopically, clusters of giant islets; some of the larger resembled ordinary islet cell adenomas. Everywhere there was evidence of compression atrophy of the surrounding acinar parenchyma. Cellular patterns ranged through all the types to be described in connection with the group of 'functioning' adenomas with no particular cytologic departure. Apparent lack of encapsulation, degrees of local hyperchromatism and the presence of a very occasional mitotic figure were per-

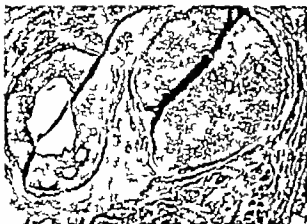


Fig. 2. Benign adenomas of islets of Langerhans with hypernephroma. Two distinct adenomas (one cystic) are shown. In the vicinity are multiple smaller adenomas and several giant islet (hemorrhagic) and eosinophilic islet (X 8).



Fig. 3. The illustration includes the major portion of a functioning adenoma. The capsule is poorly defined. Regions of calcification are apparent (adenoma) in the center (X 9).

haps somewhat unusual features but the condition was adjudged to be benign.

To our knowledge this represents the third case of hyperfunctioning pancreatic insular adenomatosis and the first with associated parathyroid adenoma (probably multiple). The pathologic findings in our case suggest the multicentric origin of certain of these tumors and accordingly the possibility of neoplasia in that portion of the pancreas not removed at operation. Only long follow up studies on these cases will establish the basis for ultimate prognosis.

Tumors encountered in this group were single in 22 cases and in 1 case multiple—detailed in foregoing paragraphs. Six of the single tumors were definitely located in the tail of the pancreas and an additional 5 were found at the junction of the body and tail of the gland. Nine of the tumors were found embedded deep in the head of the pancreas. An ectopic site was established in 1 case in which repeated resections had failed to reveal the presence of the adenoma and in the remaining case multiple tumors were present in the tail of the gland. Correlating the location of the adenomas with the nature of the operative procedures effecting their removal it was found that a location other than in the body or tail of the pancreas usually necessitated subtotal or total pancreatectomy in one or more stages. The diameters of the tumors varied from 2.5 millimeters to 6 centimeters (Fig. 3).

16 of the 22 adenomas lying between the limits of 1 and 2 centimeters. The 2 largest measured 3 and 6 centimeters in diameter respectively and 4 of the adenomas measured less than 1 centimeter of average thickness. It is most unusual for an adenoma of a size smaller than 5 millimeters to be productive of clinical hypernephrosis. Two of our tumors were unique in this regard as pointed out previously. A more or less complete fibrous or fibroelastic tissue capsule delimited 13 of the adenomas from the surrounding pancreatic tissue. In 7 instances the capsule was poorly defined, very thin or present over only a portion of the tumor. In 2 no capsule whatsoever could be demonstrated. It was accordingly felt that the absence of an investing capsule should not negate the diagnosis of an otherwise bona fide example of islet cell adenoma.

On cut surface the tumors had a pinkish or grayish color and more or less homogeneous smooth texture unlike the lobulated appearance of the surrounding gland. The consistency was somewhat firmer than that of the normal pancreas but the difference was not such as to be practically helpful in locating small and deeply lying tumors of this type. It is not surprising that a fair proportion of islet cell adenomas are found only after careful examination in the pathologic laboratory of large segments of resected pancreas. Hyaline degeneration and fibrosis were grossly apparent as degenerative changes in 5 of the tumors in this



Fig 4 Histologic details of an adenoma which demonstrated a predominance of the so-called ribbon type of architecture. Note anastomosing bands of large columnar cells which here and there seem to line the thin walled and richly provided vascular channels (hematoxylin and eosin $\times 100$)



Fig 5 This adenoma is again poorly encapsulated. Its cells are disposed in tubular and alveolar fashion. The marginal transition between the ducts, the acini, and the tumor cells is more apparent than real (hematoxylin and eosin $\times 100$)

group. An associated capsular thickening was evident. Extensive hyaline changes appeared to be fairly well correlated with a long preoperative duration of choled symptoms. In 2 of these hyalinized adenomas calcification was additionally present (Fig 3) the tumors being definitely gritty. Calcification without gross hyaline change was noted in 3 other instances.

Histologic and cytologic observations. Except possibly in the matter of specific granulation the microscopic observations herein made apply equally to the functioning and the non-functioning adenomas. The following notations however except when otherwise stated refer to the secretory group described in this study.

In general the tumors can be considered structurally in the light of gigantic islets faithfully reproducing on a large scale the normal aspects and structural relations of the islets of Langerhans. In most instances some normal features are exaggerated and repeated over and over giving the tumor a definite overall histologic appearance. As stained by the ordinary hematoxylin and eosin method and viewed under moderately low magnifications the appearance in all of the tumors was that of typical or atypical islet cells disposed in long or short anastomosing cords, ribbons or strands one to four cells thick. In the majority of the tumors the so called ribbon (trabecular) pattern predominated (Fig 4) in

others an alveolar (Fig 5) tubular or rosette arrangement was the rule and in still others the appearance of short stubby cell cords imitated the picture of the simple solid type of architecture described by Isaaji. However so frequently did the different patterns occur side by side that it was felt that no useful purpose was to be served by classifying them as separate entities. Arrangement of cells was orderly and difference of cell size not appreciable in any given adenoma.

Coursing everywhere among these anastomosing bands of tumor cells were small thin walled capillary blood vessels. Except in those instances in which fibrous or hyaline material formed a large bulk of the tumor tissue the adenomas were richly vascular. A delicate fibrous connective tissue framework accompanied the blood vessels and appeared condensed in the form of a thin or thick capsule about the periphery of the tumor where the surrounding pancreatic acinar and duct tissue was frequently compressed. In some tumors this capsule was incomplete or absent. Focally or diffusely in fifteen tumors the collagenous framework was coarse and heavy with compression of capillaries and cords of tumor cells alike. Regions of hyalinization were always present in these fibrous examples and in 5 instances calcification was found in scattered regions. Hyalinization and calcification in general tended to represent degenerative changes

TABLE I.—HYPOGLYCEMIA ISLET CELL CARCINOMA WITH METASTASIS
COLLECTED CASES FROM THE LITERATURE

Case	Author and year	Age years, and sex	Minimal sugar mg per 100 c. of blood	Survival after onset of symptoms and post-operatively	Pathologic data				
					Site number and size cm.	Atypia and mitoses	Location of vessels	Metastasis	
								Liver	Other sites
	Wilder and others (56) 1937	40 M	3	mo (Died 4 mo p op)	Tail, single 3x2.5	+II, typical granules frequent, +III	Present	+	+
	Federoff (51) 43	40 M	17	?	Tail, single large	? ?	?	+	+
3	Judd and others (33) 1934	3 F	45	mo (Died 4 wk p op)	Diffuse; single ?	+III; fairly numerous	Liver alone involved	+	Not described
4	Jacobson (33) 1934	36 M	3	mo (Died 4 mo p op)	Head, single grapefruit	8 granules present (?) not seen	Present	+	+
5	Bickel and others (8) 3	30 M	6	mo (approx)	Body and tail, single; 6	II, multi-nucleated cells; frequent	?	+	+
6	Craig and others (3) 43	4 F	30	mo (Died 6 mo p op)	Diffuse; single; 7	II, liver IV + scars	Present	+	+
7	Jeacock and others (34) 1933	3 F	5	8 mo (Died p op)	Tail, body; multiple; 6x7	II, 6 granules seen; few	Not described	+	+
8	Seckel (48) and others 19	36 M	16	yr (Died p op) wk.	Head, body; single; 4x3.5	I, 8 granules atypical, rare	Not described	+	+
	Flann and others (70) 44	4 F	16	6 mo (approx)	Head, single 6	I, rare	Not described	+	+
10	Bullinger (1) 41	31 M	30	yr (approx) (Died mo. p op)	Absent; single ?	I, no 6 granules seen, few	Present	+	+
	Quarrier and Beaumont (7) 44	31 M	4	1 1/2 wk.	Tail, single; 3	I rare	Involved	+	+
	Gray (36)† 43, 1937	44 F	7	8 mo. (Died 6 wk. p op.)	Tail, single; 3x1.5	8 cell atypical, rare II, rare	Not seen	+	+
3	Hansen and Baskin (38) 43	69 M	19 mo (Died day p op)	19 mo (Died day p op)	Tail, single; 2x1.5	No granules seen rare, multinucleated cells	Not described	+	+
	Holmes and others (case 3) (36) 43	41 M	11 mo 6 yr "Severe" yr (Died 27 days p op)	11 mo 6 yr "Severe" yr (Died 27 days p op)	Tail, single; 2x1.5	Not described, very rare	Not described	+	+
5	Brennand (4) 43	30 M	3	30 mo (Died 14 mo. p op)	Body tail; single 9	Cells irregular, II, numerous, atypical	Not described	+	+
16	Brennand and others (quoted by Gray (36) 1934)	42 M	1 1/2 yr (Died hr after last operation)	1 1/2 yr (Died hr after last operation)	Body; multiple; and ?	Atypia II, hyperchromatic nuclei II, rare	Large veins involved (dist. hepatic)	+	Not described
7	Lepore-Kruger and Docherty 43, 6	4 M	60	mo.	Tail, single; 8	III; many	Involved	+	+

*Reported also by Brennand, Gomori and Cusum (quoted by Gray 36).

†Reported also by Joslin.

Note: In addition to those and Banks (48) he collected seven cases for the literature in which there are no chemical data to establish the diagnosis of hypercholesterolemia. These are: Fabozzi (30) four cases, Zisette (37) one case, Haman (42) one case, Kowaguchi (1935) one case. It also were Duff and Murray's three cases in which hypoglycemia was known to be absent. Frank (36) reported two cases of carcinoma of the pancreas without hypoglycemia, one of them with metastasis. In the other case the patient, apparently free of spread at time of operation, underwent resection of body and head of the pancreas together with pylorus and duodenum. She is reported not to show evidence of recurrence two years after operation.

affecting tumors of long standing as judged by the clinical history. Guttulate deposits of calcium were occasionally noted.

Under higher magnification the individual cells in these adenomas were also strikingly similar to those of normal islets. They were small and varied in appearance from polyhedral through cuboidal prismatic and columnar shapes, depending on their position in the cords and lobules. In adenomas with the ribbon type of architecture the cells tended to be predominantly columnar and to lie in a direction transverse to the long axis of the ribbon. In those tumors in which alveolar clusters and pseudorosettes were prominent centrally located elements were mostly rounded and polyhedral while peripherally lying cells assumed a columnar appearance. An intimate contact with the vascular capillary network was noteworthy but invasion by tumor of vascular channels was not observed in this group (Fig 6). The cytoplasm of the islet cells was small in amount eosinophilic and nongranular in ordinary hematoxylin and eosin preparations. In degenerated regions it was sometimes voluminous vacuolated and hydropic.

The nuclei were in general indistinguishable from those of normal insular cells being small spherical or ovoid and poor in chromatin. Occasional giant forms were observed. True mitotic figures were very infrequently found but many doubtful examples were seen representing pyknotic chromatin particles associated with degenerative changes in the tumors. Nucleoli were small when observed.

Specific granulations Using the three special stains mentioned in a foregoing paragraph it was found that in two of the tumors typical beta granulations were seen in the cytoplasm of the majority of cells. In 18 tumors at least a few of the cells contained fine granular material which we considered as atypical beta granulations. In some it was dustlike in some fragmented and dispersed and in others condensed and margined as though the cells were undergoing a process of degranulation (Gomori 22). In fresh material fixed in Bouin's fluid the granulation always appeared more typical than in the older formalin fixed specimens which furnished us with the

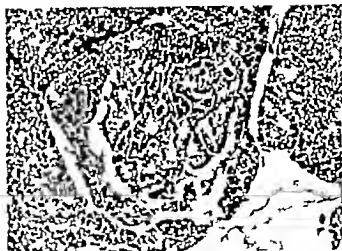


Fig 6. Projection of tumor tissue into the surrounding pancreatic parenchyma. The cells are somewhat more anaplastic than those depicted in Figures 4 and 5 and there are occasional mitoses. Although there is an entire lack of encapsulation the absence of blood vascular invasion indicates that metastasis is unlikely. The tumor illustrates the salient features of our grade 1 carcinomatous group (hematoxylin and eosin $\times 75$).

bulk of our tumors. In fact the cells in these older tumors often failed to show more than a minimum of granulation. Well stained alpha cells were seen in but 2 of the specimens where they constituted about 2 per cent by actual count. (In the necropsy series they were found more frequently.)

METASTASIZING ISLET CELL CARCINOMA WITH HYPERINSULINISM

When one considers the cellular dedifferentiation which is manifest in the growth of a metastasizing carcinoma it is surprising to note that the anaplastic cells of islet cell carcinomas can produce insulin and clinical hypoglycemia. Yet according to Hanno and Banks such a clinical effect had been observed in about half of the cases recorded up to 1943. We have abstracted from the literature (Table I) 16 cases of metastasizing and 'hyperfunctioning' islet cell carcinomas of which 4 (10 15 35 56) have been seen at the clinic. Details of a fifth case (Case 17 of Table I) probably falling into this group are presented chiefly because of the highly malignant character of the growth a feature but rarely encountered in reported cases.

A 42 year old man (Case 17 of Table I) was admitted to the hospital in stupor which rapidly progressed into coma with high fever death ensuing

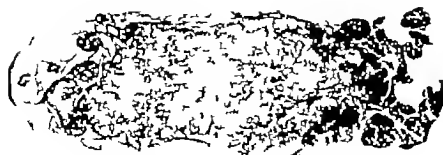


Fig 7 Metastasizing adenocarcinoma, grade 2, of the islets of Langerhans. Apparent features are the large size and the diffuse infiltration of the tail of the pancreas (hematoxylin and eosin, $\times 4$)

within a matter of 48 hours. The history of his trouble had dated back 2 months to an onset with intractable abdominal pain which extended to the lumbar portion of the spinal column and down into the testicles. Morphine was given with only intermittent relief. One month after the onset of the pain additional symptoms in the form of intermittent contractions of different groups of voluntary muscles became manifest. Episodes of rigidity leading to opisthotonos occurred and these were sometimes relieved by the taking of whisky. Three weeks before admission there developed paralysis of the right facial muscles and weakness of the right arm. Deterioration of the patient's mental status with confusion and delirium were terminal complications.

The picture on examination was that of an unconscious, very restless patient with marked nuchal rigidity and right hemiparesis. The clinical impression was that of meningitis of undetermined origin. Studies of cerebrospinal fluid showed a sugar content of less than 20 milligrams per 100 cubic centimeters. The concentration of sugar taken on admission (non fasting) was 60 milligrams per 100 cubic centimeters of blood. With a temperature that rapidly rose to 107 degrees F the patient lapsed into coma and died.

The findings at necropsy performed 3 hours after death were remarkable and included carcinoma of the tail of the pancreas (Fig 7) with involvement of peripancreatic nodes, celiac nodes, liver, left kidney, cauda equina and lumbar portion of the spinal cord. The remainder of the spinal cord and the brain failed to show metastasis.

Macroscopically the tail of the pancreas was diffusely involved by a neoplastic process which was infiltrative and in no part delineated by a capsule. The cellular clarity in form and architecture was lost. The cells of normal islets were present in small numbers and hyperchromaticism of many

Blood capillaries were numerous and thin, lying in close proximity to irregular bands of tumor cells which here and there showed actual intravascular invasion. Some large veins likewise demonstrated invasion by groups of neoplastic cells. Special stains employed to substantiate our diagnosis of islet cell carcinoma brought out the presence of fairly typical beta granulations in some of the more differentiated tumor cells. These granules were also demonstrated in the metastatic deposits.

Analysis of all 17 cases of metastasizing and hyperfunctioning islet cell carcinomas brings out the following pertinent data. The age of the youngest patient was 18 and of the oldest 73 years with an average of 47.8 years.¹

Ten patients were in the 40 to 60 year age bracket. There were 12 men and 5 women. In all of 15 cases wherein adequate clinical information was available, spontaneous hypoglycemia was present, usually in severe degree. In 2 cases there was a history of diabetes mellitus preceding the onset of the symptoms of hyperinsulinism.

One symptom in all cases was a unique and characteristic. In 9 of 10 cases there were tabular pounds (73 to 150) and usual symptoms of hypercaloric intake, hypoglycemia, and a majority of the patients had the underlying ab-

normal weight, as in the case of carcinoma, characteristic disorders wherein ranging from were noted, evidence of the failure to prevent the result was masked. J. J.

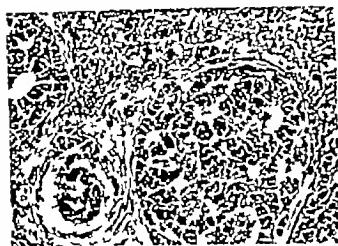


Fig. 8. Same case as in Figure 7 showing invasion of a periaortic lymph node. There is a certain resemblance to normal islet architecture but the cells are hyperchromatic and otherwise anaplastic (hematoxylin and eosin $\times 100$).

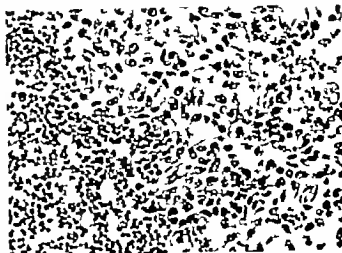


Fig. 9. Same case as in Figure 7. Hepatic metastasis from adenocarcinoma, grade 2, of the islets of Langerhans. Cellular anaplasia and mitoses are apparent features (hematoxylin and eosin $\times 210$).

that 5 of the tumors occurred in situations near enough to the common bile duct to effect obstruction to the outflow of bile. This is in contrast to the situation existing in cases of ordinary pancreatic carcinoma in which as a result of perineural invasion by malignant cells a physiologic blocking of the common bile duct results.

Average survival after development of these symptoms was about 1 year with 4 weeks and $4\frac{1}{2}$ years representing the extremes. Surgical procedures employed in these cases consisted of exploration only in 2, exploration plus biopsy in 9 and partial pancreatectomy in single or multiple stages in 2. In 4 cases the condition was discovered at necropsy.

Pathologically in 2 of the cases observed at the clinic the growth was diffuse involving the entire pancreas; in 1 the head of the pancreas was spared by a growth which extensively involved the remainder of the gland. In one there was diffuse infiltration of the tail only and in the remaining instance the process took the form of two poorly circumscribed nodules 6 centimeters and 2 centimeters in diameter located at the junction of the body with the tail of the gland. The tumors were all very large compared with their benign counterparts and they lacked any semblance of encapsulation. Involved segments of pancreas were grossly thickened, firm, nodular and often fixed by infiltration of surrounding tissues. Surfaces made by cutting revealed a

grayish or grayish pink firm tissue lacking the lobulated appearance of the normal pancreas. Red regions of necrosis and hemorrhage were seen in 3 of the tumors. Metastatic deposits in lymph nodes and liver often showed more extensive necrosis than the primary lesion. The presence of hepatic metastasis was demonstrated in all 5 cases; peripancreatic lymph nodes and omentum were additionally invaded in 3 and in 1 case metastasis was generalized.

Microscopically in the 5 tumors we were privileged to study the essential composition was that of islet like cells disposed more or less in the manner described for benign adenomas but with marked irregularity of size, shape and staining properties. Outstanding points of difference were (1) the occurrence in all the tumors of mitoses in numbers up to 5 per high power field; (2) the presence of atypical mitoses, some of giant or otherwise bizarre configuration; (3) the presence of large nucleoli in almost all of the tumor cells; (4) invasion of large or small vascular and lymphatic channels observed in every instance (Fig. 10) and (5) the occurrence of necrosis and hemorrhage.

Using Broders' method of grading malignancy it was found that 3 of the tumors were of grade 2 and 2 of grade 3. The microscopic picture in the metastatic deposits resembled that of the primary lesion. Some of the pulmonary and hepatic secondaries were extremely vascular with numerous tumor thrombi in venous blood channels. Results of

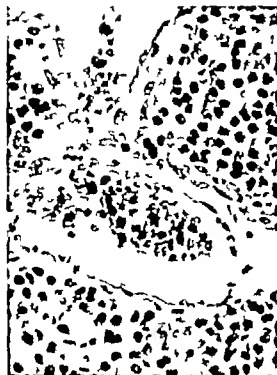


Fig. 6. Metastasizing adenocarcinoma, grade 3, of the islets of Langerhans. The outstanding feature here is the invasion of large vascular sinus by manifestly malignant cells. This phenomenon of vascular invasion seems in general to be limited to those lesions exhibiting a grade (Broders) of malignancy higher than 1. It may be very important criterion of metastasizing propensities in islet cell neoplasms (hematoxylin and eosin $\times 386$).

special stains designed to bring out beta and other granulations were indecisive except in the single case previously mentioned. In several of the other tumors atypical dustlike particles were seen in certain of the cells.

Metastasizing islet cell carcinoma¹ is a fatal disease with no patient in the literature surviving for more than 5 years after onset of symptoms. The average life expectancy from available data is 11.9 months. It is accordingly interesting that the case with the longest survival was one of two in which surgical attempts were made to remove the tumor.

Surgical exploration was performed at the clinic in 1939 and a diagnosis of adenocarcinoma, grade 3 was made on some tissue removed from a large nodule

Hanno, Frantz, and Duff and their co-authors have reviewed the literature on a few cases in which undoubted islet cell carcinomas were not associated with clinical evidence of hyperinsulinism. Discussed also in these reports are several cases in which the evidence for hyperfunction of the tumor was debatable. In our series we have not seen an example of this rare type of tumor.

lar pancreatic tumor. With this fresh tissue report the surgeon decided against an attempt at removal. Three months later at another clinic the tumor, still without visible metastasis, was removed and reported as being an islet cell tumor of questionable malignancy. Temporary clinical improvement followed. However 1 year later at a third operation the original pathologic opinion was confirmed with the demonstration of hepatic metastasis (12). The patient died in December 1943 following total pancreatectomy with excision of a metastatic hepatic nodule of tumor tissue.

The early history in this case emphasizes the fact that the presence of hepatic metastasis does not always constitute the *smoking gun* of malignancy in certain islet cell tumors, as had been previously supposed. It further emphasizes the possibility of temporarily ameliorating by surgical means the symptoms of hyperinsulinism (25) in patients suffering from the effects of carcinoma of the islets of Langerhans.

HISTOLOGICALLY BORDERLINE CARCINOMA OF THE ISLETS OF LANGERHANS WITH HYPERINSULINISM

We now consider separately a group of functioning islet cell tumors the characteristics of which were such as to place them in the twilight zone between the simple adenomas and the frank metastasizing islet cell carcinomas discussed in a foregoing section. Frantz has reviewed 26 such cases from the literature and has expressed doubt whether some of them constituted truly malignant neoplasms. In general the tumors have shared certain features of frank carcinomas, such as large size, lack of encapsulation and invasion of surrounding pancreas and of small blood vessels. Cellular anaplasia and the presence of mitotic figures were further features removing the tumors from the "garden variety of simple islet cell adenomas." Yet although recurrences have been reported following operation for removal of tumors of this type, metastasis has been lacking. Accordingly it is without surprise that we find them variously designated as adenocarcinoma, grade 1, questionably malignant adenomas, low-grade malignant adenomas and so forth. To the 26 examples cited by Frantz we wish to add pertinent clinical and pathologic data concerning 11

studied from the material seen at the Mayo Clinic. Six of the 11 patients were men and 5 were women. The average age at the time of examination was 37.6 years, the youngest patient being 21 and the oldest 61 years of age. Six were in the fourth decade of life. Symptoms similar to those noted for the benign functioning group had been present for periods varying from 1 to 8 years with an average of 3.5 years. Thus as compared with our benign "functioning" tumors the borderline neoplasms occurred in patients who were 3.9 years younger on an average. Moreover, by the same comparison the symptoms were so serious and progressive that they brought the patient to seek medical treatment in half the time period established for the benign group. These findings are in accord with similar data supplied by Frantz. Minimal blood sugar levels were somewhat higher than those found in the frankly malignant and somewhat lower than those reported in the cases with simple functioning adenomas.

In 10 of the 11 cases operation was performed, the tumors being found with fair ease and excised widely in all instances. In 1 case recurrence of symptoms necessitated a second operation which failed to reveal residual tumor. *The patient continues to have trouble.* A second patient suffered from recurrence of symptoms 8 years after removal of his tumor and died shortly thereafter. No necropsy was performed to rule out the possibility of metastasis. Two of the 10 patients died from postoperative complications. The remaining patients have been followed through symptom-free intervals varying from 4 months to 5 years but this group is too small and the periods of postoperative observation are too short for far reaching conclusions to be drawn as to clinical benignity or malignancy.

One tumor was found at necropsy. Compared with those of the benign series the tumors were large, with fissions in 6 cases attaining diameters of 2 centimeters or more. Single tumors were encountered in 10 instances and in 1 patient the process was multicentric. The body of the pancreas was given as the location for 6, the junction of the body and tail for 4, and the tail for the remaining 2 tumors.

Grossly apart from their larger size, the tumors did not differ markedly from their "simple" counterparts except in the matter of encapsulation which was completely lacking in one and partially lacking in the remainder, 10 of the tumors demonstrating gross invasion of the surrounding pancreatic tissue.

Microscopically all of the tumors showed cellular atypia with a tendency toward large cells. Hyperchromatism of nuclear elements was also universally noted focally or diffusely with some of the nuclei assuming giant unilobulated and multinucleated forms. In one neoplasm mitotic figures were very few, in the remainder they were found with moderate ease, averaging perhaps 1 in every 5 "high dry" fields examined. None was atypical or "pathologic" (so-called x and y forms). Nucleoli were in general prominent but the "bird eye" variety so commonly seen in the metastasizing group was rarely observed here. Invasion by tumor tissue of small venous channels was definitely observed in 3 instances. In 1 of these cases in which there was recurrence of symptoms in 8 years followed by death metastasis may have occurred eventually. In the second and third instances sufficient time has not yet elapsed to permit of final judgment. Some degree of hyalinization was present in all the tumors in this group and as with calcification—a change noted in 6 of the 12 neoplasms—it tended to increase with the age of the tumor as judged by the "functioning" span of its clinical life history.

Examination of 12 tumors using special staining techniques revealed cytoplasmic granularity in 8, in 3 of which the granules identified could be considered as being atypical beta. In 1 case a few alpha granules were seen. The remainder were either agranular or contained a few basophilic fragments of uncertain status.

From a purely cytologic analysis it would appear that these lesions were of grade 1 (Broders) malignancy (Fig. 6). Unfortunately in support we cannot offer undoubted clinical or pathologic evidence of metastasis. In our metastasizing islet cell carcinomas the grade of the lesion was always 2 or higher and in 1 of these cases metastasis was not present at the time of the first operation. In the borderline series the grade never exceeded 1 and in

TABLE II.—LOCATION OF TUMORS

	Cases	Tumors	Tail	Islet body and tail	Body	Head	Ectopic
Nonfunctioning group	44	5	23	3		9	
Clinically functioning adenomas	22	24*	7+*	5		0	
Functioning metastasizing carcinomas	5	5	3		(diffuse)†		
Functioning but nonmetastasizing carcinomas	11			4	6		
Total	82	34	33	12	6	9	

*As one case multiple tumors, which could not be counted, were present.

†The two diffuse tumors involved the entire pancreas.

only 3 was there evidence of invasion of veins. We feel consequently that venous invasion in any islet cell tumor and cytologic evidence of a grade of malignancy higher than 1 (Broders) are at present the most important microscopic indexes we have by way of correlating the histologic appearance of the tumor with its metastasizing capabilities.

COMMENT

Incidence. Tumors of the islets of Langerhans are rare but the recorded incidence of their occurrence varies considerably depending on the diligence of the search for their presence. Their frequency has been estimated to be from 1 in 800 to 1 in 1,000 considering necropsy material. Pappenheimer found 5 islet cell adenomas in 4,000 pancreases studied routinely at necropsy. Winters, Gottardo and McNealy at the Cook County Hospital studied material from 13,000 consecutive necropsies and failed to find a single tumor of this type. The incidence in 10,314 necropsies performed at the Mayo Clinic was 1 in 234 cases, and we have previously mentioned Dr Pease's experience with a group of 500 glands in which meticulous search yielded 8 islet cell adenomas. Six of these were of such a small size as to be easily missed on routine gross examination of the pancreas. None of Dr Pease's tumors was clinically active.

The great majority of functioning islet cell tumors furnish material for the surgical rather than the necropsy pathologist. In this functioning group it is very difficult to arrive at

any definite figures of incidence. Including our own series we have accepted the following as representing the total reported in the period from 1927 to 1945: (1) hyperfunctioning adenomas¹ removed at operation 113 cases (36 additional with insufficient data); (2) hyperfunctioning adenomas found first at necropsy 36 cases;² (3) nonmetastasizing but cytologically malignant islet cell tumors (combined surgical and necropsy statistics), 37 cases; (4) metastasizing islet cell carcinomas with clinical evidence of hyperfunction, 17 cases; (5) nonfunctioning islet cell carcinomas with metastasis 6 (?) cases.

In comparing the different groups the average ages of patients in our series show significant differences, namely (1) nonfunctioning adenomas 55+ years, (2) functioning adenomas 41.5 years, (3) functioning, cytologically malignant but nonmetastasizing group 37.6 years, (4) metastasizing islet cell carcinoma group 34.6 years.³ It thus appears that the more active the tumors cytologically and physiologically the earlier they become manifest.

Men and women were equally affected (41 men and 41 women in the entire series studied.)

Clinical symptoms. These are well known and have not been emphasized in the present analysis. It should be mentioned, however, that, paradoxically enough, the more cytologically dedifferentiated the tumor the more severe the symptoms and the shorter their duration. The paradox of marked gain of weight has particularly been stressed as a symptom in the frank carcinoma group. As previously noted, this symptom has frequently masked the seriousness of the underlying condition.

Location of tumors and incidence of multiple tumors can be seen in Table II.

The high relative incidence of nonfunctioning islet cell adenomas in the tail of the pancreas is paralleled only in a general way when we consider the functioning examples. In the literature 30 of a group of 86 functioning adenomas were listed as occurring in the

In 5 cases hyperfunctioning adenomas or carcinomas have been found in extrapancreatic (aberrant) locations.

*The clinical course and symptoms in these cases were identical with those of the previously presented surgical group.

†Average 47.8 years for all seven cases in the literature.

tail of the pancreas. In the same series the body and the junction of the body and tail were the sites of seventeen and thirteen tumors respectively. The statistical chances therefore of a functioning adenoma arising in a portion of the gland which is not too difficult to resect are about 70 per cent!—a practical observation of use to the surgeon who faced with the undoubted clinical evidence of hyperinsulinism in his patient is unable to palpate the causative tumor at surgical exploration.

In the matter of multiple tumors the functioning adenoma group may again be considered as being representative. Our incidence of approximately 5 per cent stands against 10 per cent observed in the literature (based on 100 consecutive case reports). Both figures are somewhat lower than the incidence of multiple tumors observed in the nonneuretic group found routinely at necropsy. Although multiple tumors are usually found in the same general region of the gland they may sometimes be widely separated. The surgeon who finds and removes a functioning adenoma has still an important duty to perform in carefully palpating the remaining portions of the pancreas in search for additional tumors.

Even in the matter of locating solitary functioning adenomas of the islets of Langerhans success does not by any means always reward the primary search. As indicated in our paper in only 12 of our 19 surgical cases wherein an adenoma was proved to exist, was cure accomplished by the first operation. If we add to the remaining 7 a group in which exploration gave negative results and in which the patients did not return for further surgical operation it appears that perhaps only half of our patients were cured by the first surgical attempt to locate and remove their tumors. Accordingly the present-day surgical tendency is to accept good clinical evidence as being indicative of the existence of a pancreatic islet cell tumor and failing in a search for its presence, to resect the more easily accessible portions of the pancreas known frequently to contain the tumors. This procedure has

proved valuable in our series. Removal of remaining portions of the pancreas can be accomplished later for recurrence of symptoms. Occasionally as indicated the causative tumor will involve heterotopic pancreatic tissue.

Individual islet cell tumors were with few exceptions small a matter which makes for difficulty in their identification at the time of surgical exploration of the pancreas. A diameter of 5 millimeters can generally be taken as the minimum necessary for the production of clinical hypoglycemia. Only 2 of our 'functioning' tumors failed to exceed this average size. Rarely do the functioning adenomas attain large size and when they do the bulk of the tissue is made up of fibrous and hyaline elements. The frankly metastasizing carcinomas, as a group are much larger than the benign 'functioning' tumors, the cytologically active but nonmetastasizing group providing tumors of intermediate dimensions. The nonfunctioning group range in size from 1 millimeter providing the smallest tumors in the series.

Texture color encapsulation and so forth. Trends rather than actual measurable gross differences spanned the variations noted in the different groups listed in the foregoing. Frankly malignant islet cell tumors were soft brown or brownish red hemorrhagic, and non encapsulated with gross evidence of centrifugal spread into the surrounding normal pancreatic parenchyma. Nonfunctioning tumors and benign functioning adenomas were in general grayish and firm with fairly clear delineation if not actual encapsulation. Adenomas which proved to be cytologically active or 'borderline' tended to be poorly encapsulated but in general could not be grossly separated as a group.

Microscopically whether the tumor was benign or malignant a certain resemblance of the cells and their arrangement patterns to that of normal islet cells made identification of the tumor simple. An intimate relation of tumor cells to a rich network of capillary blood vessels was noteworthy even in tumors which had undergone hyaline and calcareous change. An arrangement of tumor cells in the form of islands, acini cords, strands, or ribbons was frequently noted with all pictures

However the "statistical" evidence has been based on tumors found at operation and the proportion of operations in which the tumor has been found has been about 50 per cent. It is probable that the actual incidence of functioning tumors involving the head of the pancreas is considerably higher than the figure given.

represented in certain tumors. Although the ribbon type of architecture predominated, we saw no useful purpose in subdividing the tumors into different types based on these minor differences of cellular architecture. Development of fibroblastic stroma and the formation of an investing capsule varied greatly. Whereas in general the more cytologically active tumors were most poorly demarcated many benign tumors seemed also to invade the surrounding pancreas. In attempting to determine microscopic criteria of malignancy our efforts were only partially successful as witnessed by our segregation of a group of 'borderline' tumors. It appeared however that the metastasizing group possessed the following characteristics (1) malignancy of a grade higher than 1 as determined by the method of Broders, with cellular atypia, hyperchromatism, loss of 'polarity' and the presence of normal and atypical mitosis (2) invasion of venous channels. The "borderline" group showed cellular activity with mitosis atypical cell forms and hyperchromatism of a degree commensurate with the diagnosis of carcinoma, grade 1 by the aforementioned method. Invasion of veins occasionally seen in this group may place the tumor in question in the category of a possible metastasizing neoplasm. The frankly benign examples showed neither mitotic activity nor venous invasion. From this tentative classification it will be seen that invasion of veins by tumor cells is the all important criterion which should be sought for as the determining factor in the possibility of extrapancreatic spread of islet cell tumors.

In the matter of using special cytologic stains as a means of differentiating functioning from nonfunctioning adenomas and both of these groups from malignant islet cell tumors, our efforts proved somewhat disappointing. Even dealing with fresh material which yields the best results we were unable to substantiate the claims of others in this regard. In other words, we found beta granulations in non-functioning adenomas and failed to detect their presence in tumors producing marked clinical evidence of hyperinsulinism. The granulations found were as indicated often atypical.

SUMMARY

Asymptomatic islet cell adenomas are more frequent than hitherto believed. Routine examination of 10,314 pancreases revealed 41 such tumors and a carefully conducted study of 500 pancreases disclosed 8 tumors (1.6 per cent).

Clinical hypoglycemia originating in neoplastic proliferation of islet cells is a rare disease. Such proliferation can be manifested 4 ways pathologically (1) benign adenomas, 70 per cent (2) islet cell adenomatosis, 2 per cent (3) histologically malignant but non-metastasizing islet cell tumors, 20 per cent, (4) metastasizing islet cell carcinomas, 8 per cent.

Generally productive of a clinical history measured in half decades, the adenomas are small, fairly well encapsulated nodules with high degrees of cellular differentiation and no mitosis. The histologically malignant or "border line" tumors are on an average twice the size of the adenomas and are more vascular and more invasive. The presence of cellular atypia, hyperchromatism and mitosis is that of a grade 1 (Broders) order of malignancy and is paralleled in a general way with a relatively short clinical history. The possibility of metastasis should be considered in members of this group in which vascular invasion is present. Measured in clinical terms of months rather than years and sometimes of production of a paradoxical gain in weight, metastasizing islet cell carcinomas demonstrate a large size, gross invasive tendencies and metastasis with microscopic evidence of manifestly malignant cells and vascular invasion. In all of the groups positive results using special staining methods will be obtained in some but not all of the tumors. The results do not justify the conclusion that functioning pancreatic islet tumors are beta cell neoplasms.

Statistically speaking the surgeon can expect to find a tumor in from 50 to 60 per cent of the cases on the first exploration. The presence of multiple tumors (10 to 15 per cent in the benign group including adenomatosis and from 15 to 20 per cent in the borderline and the metastasizing malignant groups) will sometimes decide the necessity of repeated operations in search for the causative tumor (per

sistence of hypoglycemia after partial pancreatectomy for hyperfunctioning tumor)

Blind resection of the tail of the pancreas will remove 50 per cent of the tumors resection of the body as well as the tail will account for about 20 per cent more. Total pancreatectomy will occasionally be necessary for some of the small buried tumors located in the head of the gland which is the site of about 20 to 30 per cent of the neoplasms. Very rarely (1 to 2 per cent) the tumor will have an extra pancreatic location

The surgeon performing an operation for the relief of hypoglycemia must be prepared to carry out procedures ranging all the way from simple excision of an easily identified and readily shelled out tumor to total pancreatectomy. These procedures are justified by the complete failure of medical treatment of organic hypoglycemia.

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APPENDICITIS COMPLICATING PREGNANCY LABOR AND THE PUERPERIUM

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ACUTE appendicitis is a most serious abdominal disease complicating of pregnancy endangering the lives of both mother and child. Crossen and other authorities have stated that 80 per cent of all cases of acute appendicitis complicating pregnancy occur during the first 6 months of gestation. The rarity with which term labor or the puerperium are complicated by acute appendicitis is most striking. Norton and Connell reported but 1 case of term labor complicated by acute appendicitis in 20,000 deliveries at the Margaret Hague Hospital. These same authors collected from the literature and their own hospital records 110 cases of appendicitis complicating pregnancy and from this series they reported only 9 cases as a complicating problem of labor or the puerperium. Thus, it is readily seen that it is highly problematical that any one observer will personally see or attend very many of these cases, nor will he have any large or extensive experience in the treatment of this surgical and obstetrical problem. The recent advancements in surgical procedures, gastrointestinal decompression, intravenous nutrition and the chemotherapy and antibiotic therapy in the treatment of appendicitis, appendiceal peritonitis, and puerperal sepsis warrant continued review of the approach to this serious obstetrical and surgical problem if the optimum in both surgical and obstetrical treatment is to be achieved.

Historically we are familiar with the young French surgeon M^{lle}ier's attempt in 1827 to guide the surgical approach to the treatment of inflammation of the vermiform process, and only to have the great Dupuytren thwart and crush his efforts. The American pathologist

Reginald Fitz, is credited with solving the riddle of appendicitis in the year 1886. To another American P. F. Mundé, the famed New York obstetrician and gynecologist, we are indebted for the first report in 1894 of acute appendicitis complicating pregnancy.

During the succeeding 52 years, a considerable volume of medical literature has been presented concerning this surgical and obstetrical problem. Several American and European authors have collected rather extensive series of cases, most notable in this group are the articles by Hilton, Schmid, Jerlov, Heinicke, Garcia, D'Ermeo, Macs, and Norton and Connell.

The reported incidence of pregnancy complicated by appendicitis varies slightly with the various authors. Mussey and Crane, at Mayo Clinic, reported a high of 2 per cent. Schmid found the incidence in his series collected from the German literature to be 1 per cent. Cosgrove in 1937 reported an incidence rate of but one case in each 1,380 deliveries at the Margaret Hague Hospital. Johnson, in reviewing the problem in Australia, came to the conclusion that the incidence of acute appendicitis in women in the childbearing age is the same rate irrespective of whether the patient is pregnant or not. Findley found that 70 per cent of all women who have appendicitis without operation will suffer from this disease during subsequent pregnancies. Tashiro and Zinninger at Cincinnati General Hospital have verified recently the preponderance of acute appendicitis occurring in the male. They found 66.1 per cent of their series were male patients and 33.9 per cent female.

The accepted clinical signs and symptoms, as well as the established laboratory findings used in making the diagnosis of acute appendicitis, are considerably altered or masked in the presence of pregnancy. As early as 1903, Fueth called attention to the anatomical displacement of the cecum and the appendix

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during pregnancy. The roentgenological studies of Baer Reis, and Arens of this country and Guthman and Staehler of Germany have confirmed this displacement. Usually, lateral and cephalic displacement begins at the end of the third month of gestation and by the end of the sixth month the appendix and cecum are no longer pelvic organs, but rather abdominal organs. Their return to the normal anatomical position in the pelvis occurs between the tenth and twelfth postpartum days. This displacement results in the masking of the signs of muscle rigidity, rebound tenderness, psoas spasm, maximum tenderness over the McBurney point, and acute tenderness in the iliac fossa elicited on rectal examination.

Urinalysis during the early stages of the acute phase of cystitis or pyelitis often reveals little or nothing of a pathological character. Hence, the predilection to right-sided pyelitis and hydronephrosis complicating pregnancy assumes added significance in the differential diagnosis with acute appendicitis, particularly after the sixth month of gestation.

Nausea and vomiting of pregnancy are difficult to distinguish from that caused by peritoneal irritation associated with an acutely inflamed appendix. Tashiro and Zinninger found 41.9 per cent of the patients with acute appendicitis presented histories of nausea and 67.1 per cent histories of emesis. Constipation and the resultant use of laxatives during pregnancy makes the evaluation of the gastrointestinal tract activity even more confusing.

Homans states that a leucocytosis of between 10,000 and 20,000 is usually associated with acute appendicitis. Tashiro and Zinninger found in their series that the leucocyte count with acute appendicitis averaged 15,800 and with perforation 15,100 to 17,400. Virchow's "physiological leucocytosis of pregnancy" has been reported by Carey and Litzenberg to be between 8,700 and 10,000 rarely exceeding 12,500. Baer on the other hand has found the leucocytosis during labor will average 18,000 but may reach the high of 32,000. Vogt reported a progressive increase in the blood sedimentation rate during pregnancy reaching between 23 and 32 millimeters per hour in the ninth month and followed by a very gradual return to the upper

normal limits approximately 6 weeks post partum. Yet Titus warns that the finding of a rapid blood sedimentation rate indicates infection, and in a pregnant woman this is a particularly serious matter. He feels that it is safer, therefore to operate early in the presence of marked acceleration of the blood sedimentation rate.

During the first trimester of pregnancy the most common complications involving differential diagnosis with acute appendicitis are ectopic fallopian tubal pregnancy, salpingitis, early abortion, tumors of the right ovary. During the second trimester there are added right-sided nephritis, hydronephrosis, pyelitis, hydronephrosis, nephrolithiasis or ureterolithiasis, mesenteric lymphadenitis, mesenteric thrombi, intestinal obstruction, ileus duodenal and gastric ulcers, cholecystitis, and cholelithiasis. During the last trimester additional consideration must be given to premature labor, placenta previa, abruptio placentae, eclampsia and the complications of the toxemias. In the puerperium it is difficult to differentiate between the expected

after pains, parametritis, subinvolution of the uterus, cystitis, pyelitis, and the signs of acute appendicitis. Generally speaking the differential diagnosis between acute appendicitis and uterine fibroids as well as "red" degeneration of the uterine fibroids presents little or no difficulty.

McDonald reports an incidence of abortion in those cases of pregnancy complicated by appendicitis as follows: If the disease be limited to the appendix, the rate is 11.4 per cent; if an abscess be formed, the rate is 66 per cent; and in the presence of generalized peritonitis, the rate is 72 per cent. Jerlov, reporting on cases in Scandinavian hospitals, found the rate to be 13.8 per cent in the intrinsic disease, 55 per cent if an abscess had formed, and 63 per cent in the presence of generalized peritonitis.

McDonald reports a maternal mortality rate of 0.71 per cent when disease is limited to the appendix, 23.5 per cent when an abscess is present, and 30 per cent when peritonitis develops. The maternal mortality rates are the highest in patients who abort. Stoekel and Greenhill have estimated this mortality rate

at approximately 25 per cent during the last trimester of pregnancy labor and the puerperium. After rupture of the appendix, the maternal mortality rate is quoted by most authors at 50 per cent. Greenhill notes that 50 per cent of the patients abort following perforation of the appendix, and this increases the maternal mortality rate by 5 per cent. Maes and Boyce both emphasize that patients abort because they are dying; they do not die because they have aborted. Irving reported the maternal mortality rate at Boston Lying In Hospital as 11.8 per cent, and stated that 23.5 per cent either abort or have premature labor following appendectomy.

During the first 7 months of pregnancy early diagnosis and immediate appendectomy are considered the optimum in the surgical treatment of this problem. The uterus should be manipulated as little as possible during operation and postoperatively every effort should be exerted to prevent premature labor and abortion.

The therapy, treatment, and type of surgical and obstetrical procedure during the last trimester of pregnancy and labor have been the subject of considerable divergence of opinion. For this reason several of the proposed methods of surgical and obstetrical treatment of this problem as well as the date of publication are presented so that a fair evaluation may be made in the light of the most recent advancements in surgical procedures, postoperative care, chemotherapy and antibiotic therapy.

Mundé in 1894, stated "I would open the abscess at once, as soon as a reasonable probability of its existence could be settled, without reference to the pregnancy or the impending or complete delivery. I would prefer to take chances of puerperal infection from the abscess than of its unexpected rupture at any moment into the peritoneal cavity."

Cocke and Mason in 1920 said "If appendicitis occurs in the last month of pregnancy termination of the labor and the removal of the appendix are indicated. If the patient is a primipara, or if there is any doubt about immediate delivery in the multipara, cesarean section followed by appendectomy should be performed."

Wilson in 1927 stated, "If perforation and peritonitis are not present, then remove the appendix and leave the pregnancy alone. In the presence of marked peritonitis, a rapid Porro section is the safest procedure, and the low transverse section ranks next in safety; the classical section will not yield good results when performed in the presence of severe infection. To prevent the development of fetal toxicity, the displacement of surgical drains, the tearing of adhesions, and the spread of peritonitis during labor, cesarean section followed by appendectomy is advocated as the procedure which will give the best results."

McDonald in 1929 in a multipara at term and in labor manually dilated the cervix under ethylene anesthetic, performed a podalic version and extraction and then a laparotomy and appendectomy. Mother and child lived. He states "Cesarean section for cause other than obstetric should be avoided if a more conservative method of delivery is available."

Stander in 1936 said "It is suggested that the uterus be emptied by cesarean section before attacking the appendix. We, however, do not believe that this is always necessary and are convinced that its general adoption will add to the gravity of the operation."

Cosgrove in 1938 stated "Acute appendicitis is a surgical condition calling for prompt operative intervention. Its surgical treatment should not be combined with any manipulation to terminate pregnancy. This statement may be modified only by the legitimacy of a simple procedure to expedite termination of the second stage of spontaneous labor and in the case of the recognition of the very rare possibility of concurrent serious factors of obstetrical dystocia, such interference should be reserved until after the onset of spontaneous labor and then an extraperitoneal approach selected."

Zander in 1942 said "The pregnant woman with acute appendicitis is first a surgical problem and second an obstetrical problem. Operation should be carried out without delay and delivery accomplished by natural channels at term unless an absolute indication is present demanding abdominal section. Porro section may be necessary if perforation or abscess formation has occurred."

TABLE I.—SUMMARY OF 26 CASES

	Hospital No.	Age	Parity	Gestation	WBC	Pathology report	Mortality	
							Mother	Child
	94-173	32 yrs.	1	7 wks.	1,300	Acute diffuse appendicitis	N	Abortion on 4th post operative day
	3-30	yrs.		6 wks.	13,400	Acute periappendicitis	No	Abortion
3	-203	30 yrs.	2	7 wks.	1,000	Acute catarrhal appendicitis	No	Abortion
4	0-730	3 yrs.		mos.	20,000	Acute catarrhal appendicitis	N	Abortion
5	160-453	29 yrs.		mos.	27,600	Schistosoma appendicitis	N	Abortion on 9th post operative day
6	65-23	yrs.		mos.	6,790	Chronic appendicitis	No	N
7	173-374	27 yrs.		mos.	10,150	Fibrous obliteration of appendix chronic granulomatous mesenteric lymphadenitis	N	N
8	21-07	yrs.		mos.	11,450	Acute appendicitis	No	No
9	9-063	21 yrs.		mos.	9,300	Acute appendicitis	N	N
	162-58	20 yrs.	1	1 1/2 mos.	7,600	Acute appendicitis	No	No
	148-45	23 yrs.	3 mos.	16,850	Acute appendicitis (suppurative) with fecolith	No	N	
13	05-73	20 yrs.	3 mos.	6,700	Acute suppurative appendicitis	No	No	
13	27	3 yrs.	3 mos.	20,600	Acute suppurative appendicitis	N	N	
4	244-900	23 yrs.	3	3 mos.	6,300	Acute suppurative appendicitis	N	N
5	55-283	yrs.	1 1/2 mos.	13,450	Acute suppurative appendicitis	N	N	
16	74-137	yrs.	2	4 mos.	5,000	Fibrous involution of appendix	N	N
17	70-100	24 yrs.		4 mos.	8,700	Fibrous obliteration of tip of appendix	N	N
8	76-026	24 yrs.	2	4 mos.	13,700	Acute appendicitis with fecolith	No	N
9	144-101	3 yrs.		5 mos.	1,450	Acute catarrhal appendicitis	N	N
20	8-067	24 yrs.	1	5 mos.	2,800	Acute and chronic granulomatous inflammation of large bowel consistent with clinical diagnosis of periappendiceal abscess (3 yrs. p. o. pelvic) was operated on for partial intestinal obstruction which proved to be caused by large mucous adenocarcinoma of the cecum	N	Spontaneous delivery of macerated fetus on 16th postoperative day
	8-187	24 yrs.		4 mos.	6,100	Acute diffuse appendicitis	No	N
23	61-280	33 yrs.	0	6 1/2 mos.	7,000	Acute suppurative appendicitis	Died on 3rd post operative day	Spontaneous delivery of stillborn on 2nd postoperative day
3	27-450	34 yrs.		7 mos.	27,000	Acute gangrenous appendicitis with rupture	No	Spontaneous delivery of living female on 1st post operative day Wt. 855 gms died 4 hrs. after delivery
24	203-909	3 yrs.	3	9 mos.	5,000	Acute suppurative appendicitis	Died on 2nd post operative day	Spontaneous delivery living male child. Wt. 3,300 gms died 7 mos. of age
3	71-233	27 yrs.		9 mos.	1,300	Acute suppurative appendicitis	N	Cesarean delivery of living male child. Wt. 3,300 gms.
20	54-243	23 yrs.		9 months	1,500	Appendiceal abscess, retroperitoneal	No	Spontaneous delivery living female child

Case 22. Thirty hours postoperatively patient went into labor within 1 hour spontaneous delivery of stillborn. Retained placenta with post partum hemorrhage.

Case 24. Labor developed postoperatively and within 1 hour premature separation of the placenta, followed by aspiration pneumonia developed during anesthetic.

Case 5. Patient entered the hospital in labor. Transverse isoperitoneal type of cesarean section.

Case 26. Symptoms of acute appendicitis and rupture developed 6 hours postpartum. Appendiceal abscess drained on 2d postpartum day.

TABLE II—SUMMATION OF APPENDECTOMIES AND DELIVERIES AT THE UNIVERSITY HOSPITALS OF CLEVELAND 1934-1946 INCLUSIVE

Total number of deliveries	49,683
Hospital deliveries, private and staff	32,968
Home deliveries	16,715
Total number of appendectomies	9,752
Number of appendectomies performed	
males between the ages of 12 and 50 years	4,330
Total number of acute appendicitis cases	2,434
Number of acute appendicitis cases in females between the ages of 12 and 50 years	822
Total number of acute appendices with rupture	45
Number of acute appendices with rupture in females between the ages of 12 and 50 years	68
Total number of appendiceal abscesses	76
Number of appendiceal abscesses in females between the ages of 12 and 50 years	38

W Stoeckel in 1943 stated: "In the presence of peritonitis or possible abscess, the uterus must be emptied; the method of choice is for one operator to perform the appendectomy and a second operator to perform a vaginal hysterotomy following the emptying of the uterus the surgical drains can be placed in the abdominal incision and the latter closed and then the vagina repaired."

Greenhill in 1945 said: "In consideration of the high mortality of suppurative peritonitis at or near term, perhaps it is best in the interests of the two individuals, to do an appendectomy followed by a Porro section; the classic cesarean section is contraindicated; laparotrachelotomy is safer but the extra peritoneal section is still better."

Te Linde in 1946 said: "When dealing with an acutely inflamed appendix during pregnancy regardless of stage, the removal of the appendix with the least possible amount of surgery is the safest and the chances for spread of the infection are minimized. When there is evidence of peritonitis, five grams of sulfanilamide may be profitably left in the peritoneal cavity."

For the purpose of studying further this complex surgery and obstetrical problem, the records of the obstetrical gynecological and surgical services of the University Hospitals of Cleveland were reviewed for the 13 year period, 1934 to 1946 inclusive. Inasmuch as the obstetrical service maintains an in-home delivery service as a part of the outpatient service in connection with the depart-

TABLE III.—SUMMATION OF ABDOMINAL DISEASE COMPLICATIONS OF PREGNANCY, LABOR AND THE PUERPERIUM—THE UNIVERSITY HOSPITALS OF CLEVELAND 1934-1946 INCLUSIVE

Disease	Number of cases
Acute appendicitis	26
Ectopic fallopian tube pregnancy	21
Ovarian tumors or cysts	46
Cholecystitis	26
Acute salpingitis	9
Hydrophorosis	
Urolithiasis	

ment of obstetrics of the Western Reserve University School of Medicine, the home deliveries are included for this same period of time. It is the practice of this service to admit to either The University Hospitals or The Cleveland City Hospital all patients developing complications requiring hospitalization during the pregnancy, labor or puerperium. Hence, the records of Cleveland City Hospital were reviewed to assure no mistake in our series. No cases of appendicitis complicating pregnancy, labor or the puerperium which had been referred from the distinct home delivery service could be found in our records.

Table I presents in brief a summary of 26 cases of appendicitis complicating pregnancy, labor or the puerperium which have occurred in this 13 year period at The University Hospitals of Cleveland. Cases 22 and 24 are illustrative of the fatal type of postoperative complications which may develop during labor and delivery following appendectomy. The high leucocytosis range in almost every case is of particular interest. Cases 7 and 30 bespeak of the more rare complications which may be encountered. In this series, 84 per cent of the patients developed acute appendicitis during the first 6 months of gestation. The abortion rate was 26.1 per cent, the fetal and neonatal mortality rate (including abortions) was 34.6 per cent, and the maternal mortality rate 7.69 per cent.

Table II presents a summation of the total number of deliveries and the total number of appendectomies during this same 13 year period at the University Hospitals of Cleveland. In this 13 year period there was an incident rate of appendicitis complicating pregnancy, labor or the puerperium of 1 to 1,010

deliveries. An incident rate of pregnancy associated with acute appendicitis in females within the childbearing age of 1 to 31 was found.

Table III presents a summation of the abdominal disease complications of pregnancy which required hospitalization or surgery during this same 13 year period at The University Hospitals of Cleveland. Uterine fibroids have been omitted because it was not considered that they produce a syndrome which might readily be confused with acute appendicitis.

Table IV is a review of a large number of the reported cases found in literature. Jerlov's series is omitted because it is understood to be included in Heineck's series. We make no apologies for the completeness of this series for the problem of reviewing medical literature on this subject is one of considerable proportions. This series is presented primarily to emphasize the rarity in which acute appendicitis occurs as a complication of labor or the puerperium.

Within the past several months, 1 case with appendicitis complicating term labor and 1 case with appendicitis complicating the puerperium have been seen on the Obstetrical Service of University Hospitals of Cleveland. They are cases 25 and 26 in Table I. In discussing these 2 cases with our Cleveland colleagues, it was learned that 2 cases of acute appendicitis complicating the puerperium had been seen during the past year at St. Ann's Maternity Hospital of Cleveland. Through the courtesy of Dr. Edward J. Keefe and the late Dr. Ralph B. Thompson the clinical histories of these 2 cases as well as the clinical histories of the 2 cases from our own service are presented.

CASE 1 (Case 25 in Table I). B. Z. Hosp. No. 71-232. Private patient of Dr. Folger. The patient was a 27 year old white female, secundipara admitted to the Obstetrical Service of University Hospitals on September 5, 1946. She was first seen by the attending obstetrician during the third month of gestation. At this time the hemoglobin was 50 per cent, blood pressure 100/50, serology negative. Pelvic measurements were within normal limits. Previous labor was normal, and the child weighed 6 pounds, 14 ounces at birth. Present antenatal course was uneventful until the

TABLE IV—COLLECTION FROM MEDICAL LITERATURE OF REPORTED CASES OF APPENDICITIS COMPLICATING PREGNANCY LABOR AND THE PUERPERIUM

Author	Cases	Cases in labor	Cases in puerperium
Schmid	486		
Heineck	405	4	
Abrahamson	65		
D'Ercole	50		
Mace	33		
McDonald	8		
Beer, Rife, Aron	10		
Wilson	0		
Finley	7		
Porter, Servey	6		
Poppel	4		
Falbertson	3		
Congrove	24		
Garcia	20		
Smith and Bartlett	6		
Gardner			
Barber and Miller			
Grainger		2	
Kling			
Kraus			
Le Jonetel		1	
Ross			20
Milton			

sixth month of gestation at which time she had one episode of acute lower abdominal pain. Bed rest and sulfadiazine therapy resulted in complete recovery. Thirty-six hours prior to admission patient had sudden recurrence of lower abdominal pain radiating to the lumbar region and associated with nausea and vomiting. Sedation relieved these symptoms. On admission to the hospital this patient was apprehensive and in apparent acute distress. She complained of severe abdominal pain accompanied by nausea and vomiting of less than 2 hours duration. Examination revealed no abnormalities of the abdomen. Examination revealed no abnormalities of the cardiovascular or respiratory systems. The abdomen protruded with the tumor of pregnancy extending to 8 centimeters below the xiphoid process. The anterior abdominal wall was tense and tender to palpation. The rectus muscles were not rigid. There were irregular uterine contractions lasting 50 seconds and occurring at intervals of 3 to 6 minutes. Rectal examination revealed the cervix to be patulous and dilated from 1.5 to 2 centimeters. No acute tenderness was noted on tensing the rectal walls. There was no vaginal discharge. The renal areas were nega-

tive. Hemoglobin was 88 per cent, white blood cells 22,650 urine essentially negative temperature 38 degrees blood pressure 100/50 pulse 100 respirations 24 fetal heart rate, 140 in right lower quadrant. Following sedation with demerol 100 milligrams intramuscularly patient received some relief. During the next 6 hours she was observed. The uterus remained tense, the abdominal pain was more pronounced on the left lateral wall but the entire abdomen was acutely tender to all palpation. Consultation was held and a tentative diagnosis of placental separation with retroplacental hematoma and intrauterine hemorrhage was made. A secondary diagnosis of twisted gangrenous ovarian cyst was considered. The fetal heart at this time was very rapid. Cesarean section was immediately performed.

When the abdomen was opened through a low midline incision purulent exudate was encountered. Transverse laparotrachelotomy was performed. A living female infant weighing 3120 grams was delivered. The placenta and membranes were not remarkable. The myometrium was closed in layers. The uterovesical peritoneal fold was imbricated and advanced 3 centimeters in covering the uterine incision. The uterus was then delivered through the abdominal incision. Appendectomy was performed and the stump was ligated but not inverted. Ten grams of sulfathiazole crystals were placed in the peritoneal cavity. The abdominal wall was then closed in layers and the skin was closed with clips.

Postoperatively the patient was given 100,000 units of penicillin intramuscularly every 4 hours for 7 doses following which she received 20 doses of 50,000 units each intramuscularly, a total of 1,700,000 units of penicillin. A Levine tube was passed into the stomach immediately after operation and gastric suction was maintained for 72 hours. She received 250 cubic centimeters of whole blood following which she had a mild thermal type reaction. Glucose and saline intravenous solutions were given for 48 hours. On the third postoperative day she was afebrile and was given a liquid diet. On the fourth postoperative day she was given a soft diet followed by a regular house diet. She remained afebrile. On the fifth postoperative day the white blood count was 20,500. The patient was discharged on the tenth postoperative day, both she and the baby were in good condition. Pathologist's report: "Acute suppurative appendicitis."

CASE 2 (Case 26 in Table I) M. B. Hoep No. 254 243 Staff Service.

The patient was a 32 year old white female, secundipara, admitted to the Surgical Service of University Hospitals June 9, 1946. She was not attended by a physician during her antenatal course of during labor. Following delivery of a living female child weighing 7 pounds, 8 ounces she requested medical attention. The externs answering this request expressed the placenta and membranes without difficulty. She was given ergotrate, 1/320 grain by mouth. Temperature was 37.4 degrees

blood pressure, 110/65 pulse, 98. Labor was estimated at 10 hours according to the patient's story. It was not remarkable. For afterpain, the patient received 4 doses of paregoric, 1 teaspoonful at 3 hour intervals.

Approximately 6 hours postpartum, the patient experienced shaking chills accompanied by sharp pain in the right flank radiating to the right costovertebral angle. The patient was visited at the time by one of the obstetrical residents. Temperature was 39.5 degrees. Examination revealed diminished breath sounds over the right chest. The abdomen was markedly distended no rebound tenderness there was a visible bulging of the right abdominal wall over the crest of the ilium. The patient was sent immediately to the hospital and admitted on the Surgical Service with a tentative primary diagnosis of paraneuritic abscess on the right, and a secondary diagnosis of possible acute appendicitis with perforation and peritonitis.

Hemoglobin was 80 per cent, white blood cells 12,500. The urine showed traces of albumen, 10 to 15 red blood corpuscles per highpowered field, and 5 to 10 white blood cells per highpowered field. X-ray film of the chest was negative. Retrograde pyelograms revealed moderate hydronephrosis and dilatation of the right ureter. She was observed for 30 hours, following which she was taken to surgery and a retroperitoneal abscess of the right lateral abdominal wall drained of 500 cubic centimeters of thick, purulent exudate. The abscess cavity was irrigated with normal saline and at its base the cecum and the edematous appendix could be visualized. The peritoneum was not entered. The cavity was loosely packed and a large cigarette drain was inserted. Postoperatively she received intravenous sulfadiazine and 30,000 units of penicillin intramuscularly every 3 hours. After the first day sulfadiazine therapy was given by mouth. The sulfadiazine therapy was continued until her eighth postoperative day, and the penicillin until her twelfth postoperative day. Hot abdominal stupes were used for 10 days.

The temperature ranged from 39.5 degrees the first 24 hours postoperatively to 37.5 degrees on the sixth postoperative day. She remained afebrile the remainder of her hospital stay. Sulfadiazine level on the first postoperative day was 10.4 milligrams and on the eighth postoperative day 14.4 milligrams. Blood urea nitrogen on the second postoperative day was 10.5 blood chlorides, 98.8 serum protein, 6.5. Urine culture showed hemolytic *Staphylococcus aureus*. Abscess culture showed *Bacillus coli*, *Staphylococcus aerogenes*.

The patient was ambulatory on the seventeenth postoperative day and discharged on the twenty-first postoperative day. Two months after operation the abscess wound was completely granulated and there was no drainage. She was advised to return in 4 months for an elective appendectomy. Roentgenogram showed marked reduction in the size of the right hydronephrosis.

CASE 3. G. C. Hosp No C-893 Staff patient at St. Ann's Maternity Hospital

This patient was a 31 year old white female quadripara, admitted to St. Ann's Maternity Hospital July 23 1946. Previous pregnancies and labors were uncomplicated three living children. She attended the obstetrical out patient department at St. Ann's Hospital beginning in the fourth month of this gestation. During the sixth month of pregnancy, she was admitted to the hospital complaining of vague right upper quadrant abdominal pain no nausea or vomiting, no temperature elevation. Following 36 hours of bed rest patient was discharged. The patient entered the hospital at term, with labor well established. Physical examination was essentially negative. She received demerol and scopolamine analgesia during the first stage of labor which lasted 8 hours and 15 minutes. Second stage was of 55 minutes duration. Patient was given nitrous oxide oxygen and ether and delivery was by means of outlet forceps. Placenta and membranes were delivered complete. Third stage duration was 5 minutes. Patient received ergotrate 1/320 grain intravenously and then three times a day for 3 days. On the first postpartum day the patient developed abdominal distention with temperature elevation of 38 degrees. She complained of generalized abdominal pain. The white blood cells numbered 15,000. Hemoglobin was 80 per cent. Enema was given with no return. Later in the day there was one semimucous bowel movement. On the second day she developed nausea and vomiting continued abdominal distention, and temperature of 39.3 degrees. She was expelling flatus and passing loose stools. Enema was given but brought no return. One ampul of prostigmine was given every 4 hours for 6 doses rectal tube *ad libitum* penicillin 100,000 units initially followed by 30,000 units every 3 hours 4 times. Intravenous fluids were administered. On third postpartum day gastric suction was started. Penicillin and prostigmine were continued. Two enemas were given, with good results. The white blood count was 8,700 temperature dropped to 38.2 degrees. Fourth postpartum day abdomen was soft. Gastric suction and penicillin therapy were discontinued no vomiting liquid stool. Tenderness was present over the left lower quadrant and umbilicus. During the night of this day abdominal distention developed with pain in the right lower quadrant and epigastrium. Gastric suction was started again. On the morning of the fifth day the patient had a chill, skin became cold and clammy pulse 130, blood pressure, 90/55 temperature 40.1. Penicillin was restarted at 50,000 units intramuscularly every 3 hours. White blood cells numbered 11,000. Blood plasma and intravenous glucose were given. Patient lapsed into unconsciousness and her condition became progressively worse her temperature reaching 42 degrees. She died approximately 18 hours after shock had first occurred.

Pathologist's report—autopsy findings acute gangrenous inflammation of the appendix with per

foration and fecalith acute diffuse nephrosis diffuse acute fibrinopurulent peritonitis (1000 c.c.) cloudy swelling of the liver and adrenals corpus luteum cyst of left ovary, acute inflammation and necrosis of decidua acute hypertrophy of the uterus (recent pregnancy), acute hyperplasia of the spleen.

CASE 4. K. F. Hosp No 45-8309, Huron Road Hospital private patient of Dr. E. J. Keefe

This was a 23 year old white primipara. First prenatal visit was in the second month of gestation. She had a uniformly contracted pelvis—bispinal diameter 21 centimeters bicrestal, 26.5 centimeters external conjugate 18 diagonal conjugate 10.5 centimeters blood pressure 110/70 urinary, essentially negative serology negative. Physical examination revealed nothing remarkable. Antenatal course complicated by nausea and vomiting during the first 6 months of pregnancy was relieved by vitamin B therapy and sedation. X ray pelvimetry during the fortieth week of gestation revealed marked cephalopelvic disproportion with the fetal head not engaged. Elective cesarean section was performed at St. Ann's Maternity Hospital on October 4, 1945. Low cervical type under nitrous oxide oxygen and ether anesthesia. The uterus was closed in layers, also the abdomen. A living male child was delivered. Placenta and membranes were removed complete. The postoperative course was without incidence until the eighth postoperative day. At this time the patient noted general epigastric discomfort, nausea, but no vomiting. Temperature elevation was 38.2 degrees. No relief came from an enema and the use of sedation. On the ninth postpartum day there was slight abdominal distention, abdominal pain was localized in the right lower quadrant with marked rebound tenderness. Temperature was 38.5 to 38.7 degrees. Rectal examination revealed extreme tenderness in the right iliac fossa. Uterus was well involuted lochia normal. The abdominal wound was healing by first intention with no drainage and no tenderness (sutures were removed on the seventh postpartum day). White blood cells numbered 18,000 to 20,000 urine was negative. A diagnosis was made of acute appendicitis and the patient was transferred to the surgical service of Huron Road Hospital. Laparotomy was immediately performed under spinal anesthesia and cyclopropane. When the abdomen was opened through a right rectus incision profuse thin, purulent exudate was encountered. The appendix was inflamed and swollen, covered by fibrinous exudate and located retroperitoneally. Appendectomy was performed the stump was not inverted. Ten grams of sulfathiazole crystals were distributed in the peritoneal cavity. The uterine incision was walled off by the omentum and this was not disturbed. One large cigarette type drain was placed at the base of the cecum and the abdomen was closed in layers. After operation the patient received 500 cubic centimeters of whole blood 20,000 units of penicillin every 3 hours for 4 days and continuous hot abdominal stapes for 4 days. After the first post

operative day she was afebrile. The drain was removed on the fourth postoperative day. Sutures were removed on the seventh postoperative day and the patient was ambulatory on her eighth postoperative day. She was discharged on the ninth postoperative day. Pathologist's report "Acute suppurative appendicitis."

It is indeed a coincidence that these 4 cases of this serious surgical and obstetrical problem occurred here in Cleveland within the past year. Each case presents a different phase of the masked diagnostic clinical signs and symptoms. These 4 case histories warrant presentation if for no other reason than to emphasize the great difficulty encountered in making an early correct diagnosis of acute appendicitis. Case history 3 reveals the serious consequences of the delayed diagnosis followed by inadequate chemotherapy or antibiotic treatment and insufficient gastrointestinal decompression. The use of enemas and prostigmine must be attributed to the incorrect diagnosis. Cases 1, 3, and 4 present the satisfactory results following correct early diagnosis properly executed surgical procedures, adequate intravenous nutrition, maintenance of gastrointestinal decompression and sufficiently prolonged administration of chemotherapy and antibiotic therapy.

DISCUSSION

If this complicated surgical and obstetrical problem is considered as a pathological condition involving the appendix and a physiological condition involving the pregnancy then it behooves us to find the best remedy to obliterate the pathological condition. One is impressed by the geometrical rise in the mortality rates to both mother and child in the presence of peritonitis.

The optimum of treatment during the first 7½ months of pregnancy is as stated above, a well timed and properly executed appendectomy with the least possible manipulation of the uterus, gastrointestinal decompression, blood plasma, and fluids intravenously and adequate chemotherapy and antibiotic therapy. Postoperatively some authors report good results from the intravenous administration of estrogen-progesterone therapy to avoid abortion or premature labor.

The difficult problem then occurs in the treatment of the patient during the last 2½ months of pregnancy, labor and the puerperium, particularly if perforation of the appendix has taken place followed by diffuse peritonitis.

Meyer, Requarth, and Kosoff found that the lowered mortality rate at Cook County Hospital for acute appendicitis with perforation and peritonitis is chiefly attributed to the use of chemotherapy. They have demonstrated that this rate was reduced from 26.4 per cent (1928-1938) to 13.9 per cent (1941-1945). These same authors report that appendectomy with drainage is associated with the highest mortality rates. Hoerr, in reviewing the fatalities in operative appendicitis between 1913 and 1940 at the Peter Bent Brigham Hospital, found delay in operation the major factor in cause of mortality. He also states that closure without drainage is indicated in his study. Waugh, McCall, and Herrell at the Mayo Clinic found no marked difference in the relative efficacy of sulfanilamide and sulfathiazole used intraperitoneally in perforated appendicitis. They state that following implantation of either sulfanilamide or sulfathiazole intraperitoneally supplemented intravenous, oral or subcutaneous chemotherapy should not be started until after the second or third postoperative day and then may be continued for 5 days or longer if necessary. It is of note that they found high concentrations of sulfanilamide (ranging from 22 mgm. to 1,330 mgm. per 100 c.c. of peritoneal fluid) persisted at the site of the deposit in the peritoneal cavity for longer than 24 hours. They reported that the intraperitoneal use of sulfathiazole and sulfanilamide was the chief factor in reducing the mortality rate of perforating appendicitis from 16.9 to 3.8 per cent at the Mayo Clinic between 1926 and 1942.

Crile a recent report of 50 patients with proved appendiceal peritonitis successfully treated by the administration of 100,000 units of penicillin at 2 hour intervals for several days, commends the use of these large doses of penicillin in the presence of peritonitis. (He suggests that the large doses of penicillin are necessary to combat the action of the Eichen-

hina coli which is known to have an inactivating effect on penicillin)

Woltz and Zintel found no evidence of penicillin toxicity to either mother or child when penicillin was administered to the pregnant patient. Adequate penicillin levels were produced in both maternal and fetal circulation and in the amniotic fluid. Eastman in commenting on this study suggests the value of penicillin therapy in treating intrapartum infection and as a prophylaxis against intrauterine infection.

Tenney in commenting on the causes of maternal deaths in obstetrics, reports that sepsis still continues in 1946 to be one of the most important causes. He states that the treatment of sepsis resolves itself into the primary factors of blood transfusions fluids nutrition rest and chemo-antibiotic therapy.

How similar this recommendation is to 4 major contributions in the field of surgery of the past 2 decades which are applicable in the modern treatment of acute appendicitis and peritonitis (1) gastrointestinal decompression (2) intravenous nutrition (3) plasma and whole blood transfusions, (4) chemotherapy and antibiotic therapy.

The small number of cases reported in this paper warrants conservatism in recommending the method of choice in treating this surgical and obstetrical complication. It is to be recalled that acute appendicitis complicating the last trimester of pregnancy labor and the puerperium is rare hence anyone observer is hardly justified in generalizations with regard to therapy. The existence of the promising new therapeutic weapons of chemotherapy and antibiotic agents must not blind us to the importance of the many other factors involved in the proper care of the patient with acute appendicitis. In the hope of diminishing the maternal and infant (toxic) complications and maternal and fetal mortality rates the following suggested treatment warrants consideration by obstetricians gynecologists and surgeons confronted with a patient with acute appendicitis with or without perforation complicating the last 2 months of pregnancy or labor. Cesarean section by low transverse laparotomectomy followed by properly executed appendectomy intraperitoneal

implantation of 5 to 10 grams of sulfanilamide or sulfathiazole crystals massive doses of penicillin postoperatively for several days accompanied by gastrointestinal decompression, blood and plasma transfusions, and intravenous nutrition. It is to be remembered that appendectomy is performed not to treat appendicitis but to prevent peritonitis. Cesarean section in these cases provided the maximum opportunity for both mother and child to survive what may otherwise prove to be fatal postoperative complications such as adhesions disrupted surgical incisions, and intestinal obstructions with their accompanying peritonitis.

SUMMARY

1 A brief summary is presented keynoting the problem involved in making the diagnosis of acute appendicitis complicating pregnancy labor and puerperium.

2 A 13 year (1934-1946 inclusive) statistical summary of the records of the obstetrical summary of the records of the obstetrical gynecological and surgical services of University Hospitals of Cleveland, showing the incidence of abdominal disease complications of pregnancy, is presented in 3 tables. A fourth table presents the work of other authors in statistical form to emphasize the rarity of acute appendicitis complicating labor or the puerperium.

3 Four case histories of patients with acute appendicitis complicating labor or the puerperium which occurred in Cleveland during 1945 to 1946 are presented.

4 The efficacy of the use of chemotherapy and antibiotic therapy in the treatment of appendicitis and peritonitis is discussed.

5 No absolute conclusion is presented as to the optimum in the surgical and obstetrical treatment of the patient presenting acute appendicitis as a complication of pregnancy labor or the puerperium. The method which was followed in our recent cases when combined with the experience of others in the use of the modern methods of surgery and postoperative therapy and care may serve as a basis to reduce the maternal and fetal complications, and to decrease the maternal fetal and neonatal mortality rates in this serious surgical and obstetrical problem.

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PROGRESS IN THE SURGICAL MANAGEMENT OF DIVERTICULITIS OF THE SIGMOID COLON

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SINCE the turn of the century when the clinical significance of diverticula of the colon first came into prominence through the writings of Graser Fischer Beer Mayo Wilson and Giffin Moynihan Telling and others many valuable contributions to knowledge of the subject have been made by a host of workers (2 6 8 11 14 16 20 22-24 26) The literature is now voluminous, dealing with nearly every phase of the subject, such as the incidence, etiology and recognition of diverticulosis and the symptomatology classification recognition and management of the secondary pathologic changes that is diverticulitis and its sequelae Knowledge derived from these studies is widespread so that the value of further discussion of the subject would appear to be limited to emphasis and appraisal of established facts were it not that in recent years surgery of the colon has made momentous progress In view of these advances, re-evaluation of the surgical management of diverticulitis of the sigmoid seems definitely indicated to determine if the practice and teachings of former years are still valid

Surgery in the management of diverticulitis is limited largely to the treatment of certain complications notably perforation obstruction and fistula Brown wrote There should be a determined effort to avoid operation but he pointed out that it was both futile and dangerous to persist in a medical regimen after development of the complications just mentioned In addition to these classical indications for operation it is frequently impossible to exclude carcinoma on clinical grounds and exploration for this reason often is justified There is lack of agreement as to what

should be done surgically in the management of complicated diverticulitis, particularly as to the necessity of resection in many cases. Since the literature contains no report of a series of cases of diverticulitis in which surgical treatment has been carried out in conjunction with modern chemotherapy the present study therefore was undertaken with a twofold purpose in mind (1) to appraise the different surgical procedures in the management of diverticulitis of the sigmoid and (2) to determine what effect the application of modern chemotherapy has had on the immediate mortality

Records were available of 389 patients' whose diverticulitis involved the sigmoid only or the sigmoid together with a portion of the descending colon, and who were treated surgically For the purpose of this study the patients were divided into two series namely series A which comprised 245 patients treated surgically in the years 1908 to 1940 inclusive and series B which comprised 144 patients operated on in the years 1941 to 1945 inclusive. The data relating to incidence and symptomatology of the disease cited were derived from the records of the latter series (B) whereas the data relating to late results of treatment were obtained primarily from the earlier series (A) The surgical mortality rate of each series was computed.

It is estimated that in excess of 5 per cent of all individuals more than 40 years of age have diverticulosis of the colon but the condition is rare among persons less than this age Of more than 47,000 roentgenologic examinations of the colon made at the Mayo Clinic in the pe-

Patients whose diverticulitis was discovered by operation directed primarily at treatment of some other lesion, and who were not treated surgically for the diverticulitis, were not included in this series. Five patients have been included two times in this series. In each case, the patients were treated surgically for diverticulitis, the disease recurred and another series of operations was carried out. There were actually 384 individuals in the series.

From the Division of Surgery Mayo Clinic and Mayo Foundation.

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SURGERY GYNECOLOGY AND OBSTETRICS

TABLE 1.—SYMPTOMS AND SIGNS OF DIVERTICULITIS OF SIGMOID IN 144 CASES IN WHICH OPERATIONS WERE PERFORMED—SERIES B

Symptoms or signs	Cases	Per cent of 144
Evidence of inflammation	14	79
Complete or partial lateral obstruction	48	30
Diarrhea	27	9
Mucus in feces		6
Blood in stool	5	8
Mass		20
Abdominal		
Pelvic	2	40
Flank	12	
Sigmoidal carcinoma		
Sigmoidoventral		
Sigmoidoenteric		
Multiple	7	
Other type	1	

More than one symptom or sign occurred in each of many cases.

from 1941 to 1945 inclusive, diverticulosis was discovered in 8.5 per cent. It is not known in what proportion of patients with diverticulosis symptoms attributable to inflammatory changes in the diverticula will develop but Abell has estimated that 10 to 20 per cent, and Brown and Marckley that 12 to 16 per cent of patients with diverticulosis ultimately will have diverticulitis. In the same period (1941 to 1945 inclusive) the diagnosis of diverticulitis of the sigmoid was made in 600 cases which represent 15 per cent of the cases of which treatment was employed. Thus it can be estimated that in about 1 out of every 4 patients with diverticulitis complications requiring surgery will develop.

The age and sex distribution of patients in series B was in keeping with those of patients reported by others. The youngest male in the series was 29 years, and the youngest female 33 years of age; the oldest male was 80 years and the oldest female 79 years of age, while the mean age was 53.6 years at the time of the operation. The ratio of males to females was 2 to 1.

Since diverticulitis may be severe from the onset of symptoms it is not surprising that many patients required operation relatively

soon after their first symptoms were noticed. In series B 12 per cent of the patients were operated on within 1 month and 31 per cent within 6 months of the onset of the disease. It is of some interest that a greater proportion of patients in the older age groups were operated on sooner after the onset of symptoms than were the younger patients. Thus, of the patients in their forties or less, 19 per cent were operated on within 6 months of the first symptoms; of those in their fifties, 29 per cent, and of those in their sixties or more, 38 per cent.

The symptoms which the patients in series B presented are shown in Table I. Such symptoms and signs as tenderness, fever and leucocytosis have been grouped under the broad heading of inflammation. Many patients presented several of the symptoms listed. On physical examination 36 per cent had a mass which could be palpated beneath the abdominal wall or through the rectum and 41 per cent had a fistula which had followed former operative procedures or had developed spontaneously. Certain other signs, not covered in Table I, were significant and will be set forth here. Evidence revealed by sigmoidoscopic examination was of considerable value in the diagnosis. Of the 94 patients who were subjected to sigmoidoscopy findings suggestive of diverticulitis, such as unusual sacculization, angulation, fixation of the bowel, constriction of the lumen, edema of the mucous membrane or the presence of an extraluminal mass were recorded concerning 63 per cent, while one or more diverticula were visualized in examination of 14 per cent. Roentgenologic examination after barium enema was of the greatest aid in the diagnosis. This procedure was carried out on 104 patients. The diagnosis of diverticulitis, diverticulosis, or both was made in 66 per cent of this group, the diagnosis of an obstructing lesion in 22 per cent, and the diagnosis of a fistula of the sigmoid only was made in 8 per cent. Thus, in only 1 per cent did the roentgenologic examination fail to show any evidence of a lesion suggestive of diverticulitis or diverticulosis.

It is agreed generally that carcinoma is no more likely to develop in a segment of bowel

involved by diverticulitis or diverticulosis than it is in a segment of bowel not so involved. Furthermore the association of diverticulitis and carcinoma is not common. Rankin and Brown reported that in 227 cases of diverticulitis carcinoma was encountered in only 4 and that diverticulitis was present in only 4 of 679 cases of carcinoma. During the period 1941 to 1945 inclusive, 11 of the patients who were successfully operated on for carcinoma of the colon or rectum were found by the surgeon or pathologist to be suffering also from diverticulitis of the sigmoid. In 5 cases the carcinoma was situated in a segment of bowel distant from the diverticulitis. Since the operative procedure was primarily directed toward removal of the carcinoma in all of the cases, the inflammatory lesion was considered of secondary significance and this group of 11 cases was not included in the series of cases of diverticulitis.

While there is perhaps no causal relationship between diverticulitis and carcinoma, the clinical manifestations and gross appearance at operation of these two stenosing lesions are frequently indistinguishable one from the other as was first pointed out by Moynihan in 1907. In roughly 25 per cent of the cases in this series carcinoma could not be excluded by clinical methods of examination. Even at operation the surgeon was unable to differentiate between carcinoma and diverticulitis in many cases. The error was made both ways and several cases of what was mistakenly considered to be locally inoperable carcinoma were proved subsequently to be cases of stenosing diverticulitis. More frequently extensive resection was done to remove radically a supposedly malignant lesion either without preliminary colostomy or within a few weeks after the establishment of a colonic stoma. It was thought that for the patient's sake, sufficient time could not be allowed to elapse for the inflammatory reaction to subside. If the delay had been thought advisable, the inflammatory character of the lesion would have become evident.

SURGICAL TREATMENT OF DIVERTICULITIS

Various surgical procedures were employed to treat the patients in both series. The fac-

TABLE II.—DATA ON SURGICAL PROCEDURES PERFORMED IN THE CASES IN SERIES B PRIOR TO ADMISSION TO CLINIC

Previous operations	Cases	Finding on admission	Cases
Ileostomy (months previous)	1	Ileostomy	
Colostomy	10	Inadequate diversion	1
Drainage or removal of appendix	4	Abdominal fecal fistula	1
Drainage colostomy		Abdominal vesical fistula	
		Abdominal fecal fistula	
		Abcess	
		Cutaneous enterocolic fistula	
		Cutaneous fistula	
Colostomy closure		Cutaneous fistula	3
Drainage attempt to close fistula	3	Sigmoidovesical fistula	
Colostomy repair of sigmoidovesical fistula closure of colonic stoma		Vesical fistula	
Cecostomy		Sigmoidovesical fistula	
Colostomy and repair of sigmoidovesical fistula		Persistent colostomy	
Exteriorization operation		Persistent colostomy	
Colostomy and resection of sigmoid	42		
Total			

tors that influenced the choice of procedure employed were diverse. The most important of which were the presence or absence of obstruction, the acuteness of the process, the extent of the diverticulitis and of inflammation of the mesocolon, the presence or absence of fistula and the relative accessibility of the involved segment of the sigmoid. Patients treated surgically in essentially the same manner were grouped together and an attempt was made to evaluate the results following the different methods of surgical treatment both as to the immediate mortality and the ultimate outcome. It is evident that when the involved segment of bowel is not resected recurrence of the diverticulitis always remains a possibility.

The various surgical procedures to be discussed subsequently were all carried out at the Clinic. Many patients in both series had had previous operations, because of diverticulitis before they were first seen here. Since many such operations on patients in series A were of historic interest only they will not be mentioned. The previous operations on patients

carried out in 5 cases and in 3 cases, subsequent attempts to close the stoma had been made, all of which had failed.

A conception of the disability and the serious condition that may follow closure of a colonic stoma, made with adequate indication in treatment of complicated diverticulitis can be gained from review of the following case.

A physician, 47 years of age, had the first symptoms of diverticulitis 2 years before he was first seen at the clinic. At that time an exploratory operation had been done because of lower abdominal tenderness and pain. A pelvic abscess due to perforating diverticulitis was found and appendectomy was done. Following this operation a persistent external fecal fistula developed and the patient continued to have recurrent pelvic abscesses.

Approximately 2 years after this operation a double-barreled colonic stoma, orad to the diverticulum, was established at the clinic and the pelvic abscesses were drained. Complete relief from all symptoms followed and the patient insisted that the stoma be closed in spite of advice to the contrary. At his request, also, the ventral hernia that resulted from the original operation was repaired about 6 weeks after the closure. Less than 3 months later recurrence of the diverticulitis and development of another pelvic abscess necessitated the establishment of a second double-barreled colonic stoma. The patient was much relieved again but returned to the clinic 6 months later when at his insistence a second attempt was made to repair the ventral hernia. This operation was complicated by extensive infection of the body wall which required drainage on several occasions. Three and a half years after establishment of the first stoma, and approximately 1 year after establishment of the second stoma, the patient was persuaded to submit to resection of the involved segment of sigmoid. An exteriorization type of operation was done. The resulting temporary stoma and the previously established colonic stoma were closed successfully and without complications within 18 weeks of the exteriorization operation.

In all he was almost completely disabled for 6 years from the time of the first operation and he spent considerably more than half of this time in a hospital.

Resection of the involved segment of colon. The majority of patients in both series were subjected to some type of resection of the involved sigmoid. It is our feeling that when adequate indications exist for surgical interference, the safest procedure is to establish, orad to the lesion, a colonic stoma that completely diverts the fecal stream and then to allow sufficient time for the inflammatory

reaction in and around the walls of the sigmoid to subside before attempting further surgery. Whether or not subsidence has occurred can be judged from proctoscopic and roentgenologic examination but, as a rule, 6 months to 1 year should elapse before resection is undertaken. Obviously whenever serious suspicion of malignancy exists, the resection must be undertaken much earlier. The presence of extensive peridiverticulitis materially increases the risk of resection. From the present review it would seem, also, that exteriorization operations are safer than procedures in which primary anastomoses are attempted.

Preliminary colonic stoma, subsequent exteriorization operation.—In series A, 21 patients were treated by means of a preliminary colonic stoma and a subsequent exteriorization operation. There were 3 hospital deaths in the group, a mortality rate of 14 per cent for the resection. Of the remaining 19 patients, 16 are well. Of the 3 remaining patients of the 19, 1 has continued to complain of pain in the region of the exteriorization operation and 1 committed suicide 2 years after the operation, presumably because of ill health. The final patient of the 3 died elsewhere of what was reported to be obstruction of the bowel 1 year after the resection.

In series B 41 patients had an exteriorization type of resection following establishment of a colonic stoma. There were no deaths in this group.

Preliminary colonic stoma with subsequent end-to-end anastomosis.—In series A, 24 patients were treated by means of preliminary colonic stoma and subsequent resection with an end-to-end anastomosis. There were 4 deaths, a hospital mortality rate of 17 per cent for the resection. The colonic stomas of 3 patients who survived the operation were still open at the last report and 1 patient in the group has been lost track of. Fifteen of the 16 remaining patients are well and 1 patient has a persisting fecal fistula at the site of the resection but no other symptoms.

In series B this type of operative procedure was performed on 20 patients with 1 fatality.

Resection without preliminary colonic stoma.—There is a small group of cases of complicated diverticulitis in which it is relatively

safe to perform a primary resection and to unite the bowel by end-to-end anastomosis. The criteria of safety for such a procedure are (1) There should be no evidence of obstruction (2) The inflammatory process should be chronic or mildly subacute (3) The involved segment of the bowel should be short, so that after resection the two cut ends of the bowel which are to be united are free of inflammatory infiltration. Safety will be further assured if before closing the abdomen a temporary colonic stoma is established in a loop of bowel orad to the site of resection.

Primary resection of the involved segment of colon was carried out in 98 cases in series A. An exteriorization type of operation was done in 76 cases with 13 deaths in the hospital. Primary resection with end-to-end anastomosis was employed to treat 16 patients with 2 deaths in hospital and primary resection with side-to-side anastomosis was done in 2 cases without a fatality. In the 4 remaining cases, continuity of the bowel was not re-established and the patients were left with single-barreled colonic stomas. One of these patients died. The mortality rate of 16 per cent in these 98 cases compares favorably with the mortality rate of the two stage operation of preliminary colostomy and resection which was 15 per cent. It is probable however that patients treated by primary resection had no obstruction and less extensive and less complicated diverticulitis than did those treated by means of preliminary colostomy and subsequent resection.

As mentioned above, primary resection without anastomosis was attempted in 4 cases each of the patients was left with a single-barreled colonic stoma. The indication for this procedure usually was that the bowel was so shortened that neither an exteriorization operation nor primary anastomosis was thought feasible at the time of resection. One patient as has been said died following the operation; 1 patient subsequently underwent successful anastomosis between the sigmoid and the rectosigmoid and 2 patients remained well but with the colonic stoma.

Now to cast back a few sentences to primary exteriorization operations. Results were comparable to those following other types of

resection. Fifty of the 63 patients who survived the operation were entirely well and 9 others were well but had fecal fistulas at the site of the exteriorization. In 7 of these 9 cases one attempt at closure failed and in 2 of the 9 closure had not been attempted. Two patients of the 50 died of causes unrelated to their diverticulitis and 2 others complained of persisting pain in the region of the operative incision.

Fourteen patients survived the operation of primary resection with end-to-end anastomosis. Nine patients were well at the last report. Three had persisting fecal fistulas with attacks of inflammation. In 1 case of this group of 3 a colonic stoma was made subsequently and since then the patient has remained well with the stoma. In the remaining 2 cases of the 14 strictures of the bowel developed at the site of the anastomosis. The late results following this type of resection were less satisfactory than those following other types of resection.

In series B primary resection of the involved segment of sigmoid was carried out in 48 cases. An exteriorization type of resection was performed in 38 cases with 1 fatality. In 6 cases primary resection of the sigmoid with end-to-end anastomosis was performed and before closure of the abdomen a temporary colonic stoma was established in a loop of the patients survived. Primary resection with end-to-end anastomosis without colostomy was carried out in 4 cases with 1 fatality.

Other operative procedures. In series A other procedures were carried out rarely usually because of unusual circumstances. In 2 cases after preliminary colostomy the involved segment of colon was resected and the ends above and below the resected portion were turned in and dropped back into the abdomen. One of the 2 patients died of pulmonary embolism and the other remained well with the double-barreled stoma. Cecostomy in 2 cases ileocolostomy and appendicostomy in 1 case each were carried out for treatment of high grade obstruction. Three of the 4 patients died and the remaining patient recovered and required no further surgical treatment. Ileocolostomy was attempted in 3 cases with 1 death in hospital. One patient had recurrent partial ob-

TABLE III.—MISCELLANEOUS SURGICAL PROCEDURES CARRIED OUT AT MAYO CLINIC IN SOME OF THE CASES OF SERIES B

	Cases
Drainage of pelvic abscess	
Closure of colonic stomas Stomas established elsewhere	4
Stomas followed resection of sigmoid elsewhere	
Colostomy and closure of jejunoileal fistula	
Colostomy and repair of fistula	
Colostomy repair of fistula and closure of colonic stomas	
Colostomy resection of sigmoid, ileocecalostomy and partial colectomy	

struction and 1 a persistent fecal fistula after this procedure. In 2 cases the sigmoid was simply wrapped in omentum. One of these 2 patients continued to have recurring attacks of diverticulitis while the outcome in the other case is not known. In 3 cases, drainage of an abscess caused by diverticulitis was the only surgical procedure employed. The results in all 3 cases were poor. In 1 other case, the sigmoid was freed up and sutured to the body wall with no improvement in the symptoms.

Miscellaneous procedures which included resection and which were employed in series B are represented in Table III.

Mortality in series A and B compared. The surgical procedures employed and the mortality rates in the two series are shown in Table IV. In comparing the two series, the most noteworthy feature is the marked reduction in mortality rate in series B to 4.2 per cent together with a decided rise in the rate of resectability. Of the 245 patients in series A, resection of the involved segment of sigmoid was carried out in 146 or 60 per cent, whereas of the 144 patients in series B the bowel was resected in 111 or 77 per cent. The contrast between the two series is even more striking when the mortality rate in the cases in which resection was performed is compared. Of the 146 patients (8 from the miscellaneous group of Table IV) in series A who underwent resection 24 died in hospital a mortality rate of 16 per cent whereas of the 111 patients in series B who underwent resection 3 died, a mortality rate of 2.7 per cent.

TABLE IV.—SURGICAL PROCEDURES AND MORTALITY RATE

Surgical procedures	Series A: 1908-1940			Series B: 1941-1943		
	Patients	Deaths	Per cent	Patients	Deaths	Per cent
Colostomy only	28	6	21.4	11	—	—
Colostomy subsequent closure	3	—	—	7	—	—
Colostomy subsequent exteriorization	43	3	7.0	41	—	—
Primary exteriorization	16	3	17.7	28	—	—
Colostomy subsequent resection and end-to-end anastomosis	24	4	16.7	20	—	—
Primary resection, end-to-end anastomosis and colectomy	—	—	—	6	—	—
Primary resection, end-to-end anastomosis. No colectomy	6	—	—	—	—	—
Miscellaneous	28	7	25.0	16	—	—
	178	26	14.6	144	3	2.1

As explained in the text (paragraph 2), there were actually 3 patients less than 144.

Of the 6 patients in series B who died, infection attributable to the operation was the cause of death in 3 cases. Infection of the abdominal wall developed in 2 cases following resection and in the third peritonitis developed 2 days following repair of a jejunoileal fistula that was caused by the crushing of the spur of a colostomy that had been performed elsewhere. The fourth patient of the 6 died of gangrenous cholecystitis following closure of a colonic stoma. The fifth patient a woman, 71 years old, whose intestine was acutely obstructed died from bronchopneumonia 21 hours after colostomy. The sixth patient died of cerebral hemorrhage 14 days following an exteriorization operation and abdominal hysterectomy.

COMMENT

We are convinced that the improved results obtained in series B are definitely attributable to chemotherapy. Nevertheless, the two series of cases are not altogether comparable because, in the past 20 years, other changes in routine surgical management in all colorectal cases may have influenced the results. A more

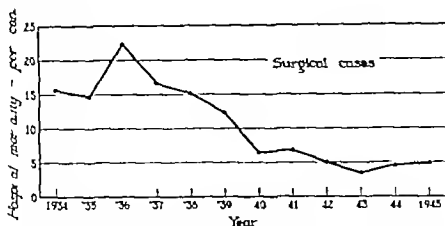


Fig. 1 Mortality among patients subjected to operation for malignant lesions of the large intestine and rectum, 1934-1945

accurate appraisal of the value of chemotherapy in surgery of the colon could be obtained by comparing the results of two large series of colonic cases in which conditions were practically identical except that chemotherapy was employed in one series.

Since the organization of a special colon service in the Mayo Clinic nearly 20 years ago all patients with lesions of the colon and rectum who are considered candidates for major surgical treatment have received pre-operative treatment in the hospital for 3 to 5 days or longer depending on the condition of the patient. The principal objectives of the treatment are (1) to decompress and cleanse the large bowel (2) to combat loss of blood and to establish and maintain protein balance by blood transfusions (3) to combat dehydration by intravenous injection of saline and glucose solutions (4) to establish and maintain concentration of vitamins especially as regards vitamins C and K (5) to combat potential infections by chemotherapy.

In the fall of 1939 we began using the sulfonamide compounds in colonic surgery. At first perhaps because of the surgeon's innate skepticism concerning the value of drugs especially any drug with such advance build up as had been given to the sulfonamide compounds 5 to 10 grams of the crystals were only occasionally placed in the peritoneal cavity prior to closure of the wound in those cases in which peritonitis was feared because of actual or suspected soiling. As experience enlarged the surgeon slowly and perhaps with reluctance became convinced of the effi-

cacy of the sulfonamide compounds and began to use them routinely. Since 1942 following the research of Poth succinyl sulfathiazole (sulfasuxidine) has been given by mouth routinely as a preparatory measure 12 to 15 grams daily over a period of 3 to 5 days. In recent years after the supply of penicillin became readily available, this substance has been used frequently as an added measure of therapy. Other than the introduction of chemotherapy there has been in the Mayo Clinic no major change in the management of colonic and rectal lesions during the past 12 years. Since therefore there was only one variable factor of importance in the management of patients during this period, it appeared worth while to compare the immediate surgical results in cases in which the patients had not had the benefit of chemotherapy with those in which the patients had received it. For this purpose the yearly hospital mortality rate of all patients who had undergone any operation for carcinoma of the colon or rectum from 1934 to 1945 inclusive was computed. As Figure 1 reveals, the mortality rate before 1939 varied between 15 and 20 per cent. A slight drop occurred in 1939 the year in which the sulfonamide compounds were first casually or intermittently used and then in 1940 there was a precipitous drop to around 5 per cent where the rate has since remained.

In addition the yearly surgical and resectability rates for the same 12 years were determined. The surgical rate is defined as the number of cases in which operation was performed divided by the total number of cases

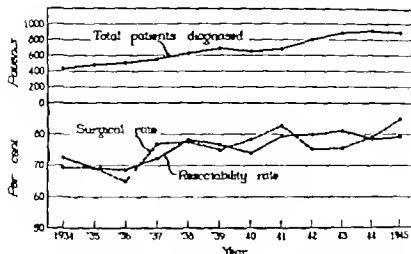


Fig. 2. Resectability rate of patients with malignant lesions of large intestine and rectum, 1934-1945.

in which a diagnosis of carcinoma of the colon or rectum was made. The resectability rate is the number of patients on whom resection was performed divided by the number of patients on whom operation was performed. As indicated in Figure 2 there has not been a decline either in the surgical rate or in the rate of resectability during the years of decline in mortality. Instead, there has been an appreciable rise.

Finally in order to determine the influence of the factor of infection on the hospital mortality rate the cause of death of all patients in this series was tabulated. Since peritonitis and pneumonia are unequivocally infections, it seemed pertinent to compare the incidence of these two complications as a cause of death in those cases in which the patient had received little or no sulfonamide compound with those in which the patient had received adequate dosage of sulfonamide. As indicated in Figure 3 the mortality rate in each category decreased as the years passed.

The changes that have occurred in surgery of the colon since the introduction of chemotherapy have been as spectacular and revolutionary as the changes wrought by iodine therapy in surgery of exophthalmic goiter. The analogy is striking. In the preiodine era of thyroid surgery for exophthalmic goiter technical perfection of the surgical procedure of partial thyroidectomy was no definite assurance that the patient would endure the

operation for not infrequently severe hyperthyroid crisis would supervene, resulting in fatal issue. Likewise, in the era of colonic surgery before chemotherapy was available, technically errorless resection of a segment of bowel was not definite assurance that the patient would survive, for not infrequently infection would spread to produce fatal peritonitis. The surgeon who worked in each field after resorting to refinements of technique and other measures, finally learned that the best means of combating the hidden danger (acute hyperthyroidism in the one and spread of infection in the other) was to divide the operation into stages. In both fields, employment of stage procedures resulted in marked improvement but only partially eliminated the hidden dangers peculiar to each. Thus it was only after preoperative iodine therapy had been standardized that the surgeon could be reasonably assured that, barring some accident, his patient with exophthalmic goiter would endure an uncomplicated partial thyroidectomy in one stage. And so, in the field of colonic surgery only in recent years, since the advent of chemotherapy could the surgeon be reasonably confident that his patient with a lesion of the colon or rectum would survive an uncomplicated resection of the colon. Finally as the statistical data obtained in the preiodine era were not a sound basis for appraisal of modern thyroid surgery so the results in the era before chemotherapy

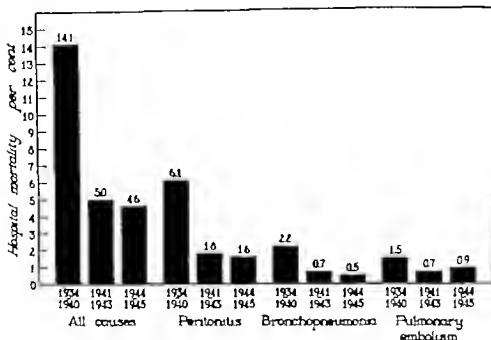


Fig. 3 Causes of death. Mortality from various causes of death following operations for malignant lesions of the colon and rectum, 1934-1945.

are not a fair basis for judging modern colonic surgery. Although iodine and chemotherapy each has markedly reduced the incidence of the most dangerous complication in its respective field, it must be strongly emphasized that both forms of therapy must be considered as extremely valuable adjuncts to surgery put by no means as substitutes for the proved principles of sound surgery.

The marked reduction in the hospital mortality rate associated with the surgical treatment of diverticulitis suggests that the indications for surgical treatment should probably be broadened. As indicated previously there is general agreement that uncomplicated diverticulitis should be managed conservatively and that surgical treatment should be advised only if complications have developed. Non-surgical treatment has definite limitations. It cannot be relied on to bring about complete subsidence of the inflammatory process nor to prevent development of complications which will require operation nor even to free the patient from his symptoms. It follows that in many cases under nonsurgical management the patient has some disability and there is always the possibility of the subsequent development of complications which will require operation. Furthermore, as we have demonstrated, the safest type of opera-

tive treatment for complicated diverticulitis is the establishment of a colonic stoma orad to the inflammatory segment of bowel followed by resection of the involved segment after many months of the patient's living with his colonic stoma. Both the reluctance to advise surgical treatment and the choice of staged operations in the past are readily understandable in view of the former mortality rate of approximately 15 per cent. With a reduction of the mortality rate to about 4 per cent the proposal that operations should be advised for less complicated diverticulitis may be seriously entertained. It is probable, as well, that the surgical mortality rate could be reduced even further if patients with less extensive disease were operated on and certainly a greater number of single stage procedures and even resections with primary anastomoses could be carried out safely. The advantage of removal of the involved segment of bowel with subsequent cure of the patient, is evident when the uncertainty associated with nonsurgical management is considered.

SUMMARY

While the great majority of patients suffering from diverticulitis of the sigmoid portion of the colon respond satisfactorily to nonsurgical management, the complications of per-

foration obstruction and fistula usually require operation. Surgical exploration and frequently resection of the involved segment of colon are indicated at times because of the impossibility of distinguishing with certainty between carcinoma and diverticulitis. In the present series carcinoma could not be excluded with certainty in about 25 per cent of the cases in which a preoperative diagnosis was ventured.

Local excision of an inflamed diverticulum or local excision of a fistula and closure of the wall of the bowel was possible rarely but was followed by unsatisfactory results in approximately half of the cases in which it was attempted.

The establishment of a colonic stoma oral to the lesion was associated with a hospital mortality rate of 5.1 per cent in those cases in which treatment was given in the era before chemotherapy was available and with a rate of 1.1 per cent in those cases in which chemotherapy was employed. Excluding a small group of patients who died essentially of pelvic abscess and infection a large percentage of the patients with a colonic stoma oral to the lesion remained clinically well as long as the stoma was maintained. Of the patients whose stomas were closed and resection of the bowel was not done, only about a third remained well. Results following closure of the stoma without previous resection of the involved segment of bowel were so unsatisfactory that we are of the opinion that as a rule, resection should be done in all cases unless proof can be established of complete subsidence of the inflammatory process.

The safest plan of treatment proved to be establishment of a colonic stoma oral to the lesion followed after an interval of 6 to 12 months by an exteriorization type of resection. Resections of this type were associated with a hospital mortality rate of 13.6 per cent in the era before chemotherapy but there were no deaths after chemotherapy became available. The results after both primary resection and following resections done after establishment of a colonic stoma were satisfactory in that approximately 80 per cent of the patients were cured. The results were less

satisfactory in the group of patients who underwent primary resection with end-to-end anastomosis of the bowel.

The employment of modern chemotherapy in the surgical management of complicated diverticulitis of the sigmoid has partially eliminated the occurrence of serious infections and thereby has been the major factor in the marked reduction of the surgical mortality from 14.7 per cent to 4.2 per cent.

With the risk of operation so markedly reduced and in view of the obvious advantage of resection serious consideration can be given to broadening the indications for surgical treatment for diverticulitis.

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METHODS FOR DIFFERENTIAL DIAGNOSIS OF PAINLESS JAUNDICE

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MUCH has appeared in the recent literature concerning the differential diagnosis of surgical jaundice (1 3 5 7 8 11). We are presenting here a few simple, practical methods for this differential diagnosis based on clinical and laboratory data of a type practicable even by those with limited laboratory facilities. Many of the recent articles stress the use of complex laboratory examinations which require highly skilled and specially trained technicians. The tests herein included can be performed in any ordinary laboratory and have been exact enough to enable accurate diagnosis 98 per cent of the time.

Painful jaundice is almost always due to stones and therefore presents little in the way of a diagnostic problem though occasionally hepatitis may cause confusion. Painless jaundice, however, presents a somewhat complex diagnostic problem due to the great group of hepatitides. This diagnostic problem is simplified if one is familiar with the normal physiology of bile pigments and with the basic abnormal physiology of the various types of jaundice, and in addition makes use of the common basic laboratory tests required for the differential diagnosis of painless jaundice.

In Figure 1 is seen the normal physiology of bile pigments (2). Bilirubin I designates that form of bilirubin which has not entered the liver cell and bilirubin II represents that form of bilirubin which is either in or which has passed through the liver cell. Also from the diagram one sees how urobilinogen is formed by a process of reduction of bilirubin II in the intestine. Urobilinogen is then excreted in part in the feces and reabsorbed in the portal blood. Normally the reabsorbed pigment is practically all re-excreted in the bile. The junction of the arrow to the

kidney with the arrow of reabsorption indicates the passage of urobilinogen into the blood and its excretion by the kidney when urobilinogen is presented to the liver faster than the liver is able to reconvert it to bilirubin II.

The physicochemical properties of bilirubin I and bilirubin II are of importance as a basis for the understanding of certain laboratory data. Bilirubin I is a colloidal compound which is readily oxidized and passes slowly into the tissues with the result that high concentrations are necessary before clinical jaundice is manifest. Bilirubin I is insoluble in water and Ehrlich's solution but is soluble in alcohol. Bilirubin II is also a colloidal compound but is combined with bile salts. It is slowly oxidized and passes readily into the tissues and is therefore visible at lower levels than is bilirubin I. Bilirubin II is soluble in water, Ehrlich's solution and in alcohol.

The common basic laboratory tests required for the differential diagnosis of jaundice are (1) Van den Bergh reaction (2) Pettenkofer test, (3) Hay's test (4) Gmelin's test (5) foam test, (6) galactose tolerance test. All of these tests are required and should be used in conjunction with other clinical data.

The Van den Bergh reaction a modification of Ehrlich's diazoreaction is employed for the detection of bile pigments in the blood serum. There are two main types of the reaction based upon whether the bile pigment has or has not passed through the liver cell. The direct reaction occurs with bilirubin II and is chemically possible because of the solubility of the substance. One cubic centimeter of Ehrlich's solution is added to 1 cubic centimeter of serum and within 30 seconds a violet color of bilirubin is formed. The indirect reaction occurs with bilirubin I and is also based upon its solubility. One cubic centimeter of serum plus 2 cubic centimeters of 95 per cent alcohol plus Ehrlich's solution results in a reddish

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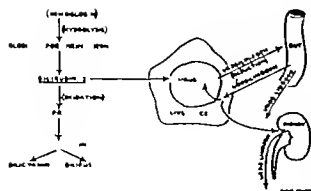


Fig. Bile pigments.

violet color developing immediately. The direct reaction is usually indicative of obstructive jaundice or some condition in which bilirubin II is present in the blood stream. There are two subreactions under the direct type namely the delayed direct and the biphasic reaction which usually indicate a jaundice due to liver damage. The indirect reaction due to bilirubin I is commonly seen in hemolytic jaundice and collections of old blood. Normal serum will also give the indirect reaction. All sera which give the direct test will also give the indirect test. The indirect test is used as a quantitative measure of serum bilirubin. When the bile salt concentration in the blood is elevated a direct test results because bilirubin II is formed when bile salts are added to normal serum.

The Pettenkofer test for bile salts is performed by adding 10 per cent cane sugar solution plus 3 drops of concentrated sulfuric acid to 5 cubic centimeters of the fluid to be tested. If bile salts are present a red ring will form at the junction of the solutions. The red colored ring is due to cholic acid.

The Hay's test depends upon the phenomena of lowered surface tension which is produced by the bile salts. This action is due to the fact that bile salts act as wetting agents. Flowers of sulfur are added to the solution to be tested and sink immediately when the urine contains over 0.5 milligram per cent of bile salts. They sink with agitation in the range between 0.0025 and 0.5 milligram per cent. In solution containing less than 0.0025 milligram per cent the flowers of sulfur will float in spite of agitation. This test is the basis of

a quantitative determination of bile salts in the urine (13).

The Gmelin's test is used to detect bile in urine. The fluid to be tested is passed through a moistened filter paper to which is added a drop of fuming nitric acid which oxidizes pigments resulting in a series of colored compounds yellow red green violet.

The foam test is the most simply conducted for the detection of bile in the urine. It consists of a greenish foam forming over the solution when it is shaken. This action is also based on a lowered surface tension.

The Icteric Index is of no additional value when the quantitative Van den Bergh reaction is used and therefore merits no discussion.

Another test of considerable value is the galactose tolerance test which is based upon the principle that galactose is not converted to glucose by the liver when considerable damage is present. Because this is only a rough test of liver function and considerable liver damage must be present before the test is impaired, it lends itself admirably to the purpose. This test consists of giving 40 grams of galactose and checking the urinary excretion. In the normal patient less than 3 grams will be excreted in the urine in a 5 hour period. In jaundice due to or with severe liver damage the amount of excretion will vary from 4 to 6 grams in 5 hours depending upon the degree of liver impairment.

The final important laboratory test is the Schmidt's test for the detection of urobilin concentration in the stools. The stool is incubated for 24 hours with Ehrlich's reagent and a quantitative estimation is then made of the diazobilirubin resulting. If the concentration is below 5 to 10 milligrams, the test is said to be negative. If it is above, it is positive. The presence of urobilin in the stool of course indicates that bile is getting into the intestinal tract to form urobilinogen (9, 13, 15). Urobilinogen in urine may be detected by a similar method but without incubation. Watson has recently described a semiquantitative method for urobilinogen in stool and urine which may be used (9, 15).

The basic examinations for diagnosis in a given case are therefore first conducted on the urine to determine the presence or absence of

bile and urobilinogen on the stool to determine the quantitative amount of urobilin on the blood to determine the size shape number and character of the red blood cells the quantitative amount of bilirubin in the serum, and the type of Van den Bergh reaction obtained. The galactose liver function test is then carried out to determine the degree of impairment present.

In the nonobstructive type of jaundice, the abnormal physiology is briefly that bilirubin I is formed more rapidly than the liver can convert it into bilirubin II. This occurs in three abnormal physiologic states

The first of these states is the condition in which the liver is normal but the blood cell destruction is markedly increased. The clinical examples of this group are the so-called acholuric jaundice congenital hemolytic icterus and toxic hemolytic icterus. The results of the basic examinations for this type of physiologic disturbance are based upon a high bilirubin I content in the blood. The Van den Bergh reaction is indirect and of variable quantity usually rather high. The urine contains no bile nor bile salts but has an increased urobilinogen content the stool will show a positive Schmidt's test and the galactose tolerance will be less than 3 grams in 5 hours indicating normal function of the liver.

The second state is that in which the liver is moderately impaired and the blood cell destruction moderately increased. The clinical representatives of this group are black water fever and pernicious anemia. Examination of the urine and stool show findings similar to the first state also the Van den Bergh reaction both quantitative and qualitative, will be similar. The diagnostic differences will be found in examination of the red blood cells and by an impaired galactose tolerance, approximately 4 grams excretion in 5 hours.

The third state in which this occurs is that seen when the liver is severely impaired and the red blood cell destruction remains normal. This is clinically seen theoretically in severe terminal cirrhosis. The diagnostic laboratory finding is a markedly impaired galactose tolerance test usually around 6 grams excreted in 5 hours. The values for the quantitative

Van den Bergh will usually be considerably lower than in the other two states but may terminally closely approximate them.

Several other points in the differential diagnosis of nonobstructive jaundice are of the utmost importance (1 5 7) In hemolytic icterus the signs of increased bone marrow activity are present there is an anemia if the breakdown of red blood cells is more rapid than the bone marrow can supply cells with a normal hemoglobin content. In the congenital form of hemolytic icterus the red cells are spherocytic, are more fragile than normal and the serum contains an elevated specific hemolysin titer. In the toxic hemolytic icterus the specific hemolysin titer and the cell fragility are normal. The diagnosis of jaundice occurring in pernicious anemia and thrombopenic puerpera is corroborated by the other clinical signs by the symptoms and by the laboratory findings of the diseases.

Obstructive jaundice is divided into two classes based on the site of the obstruction namely intrahepatic and extrahepatic.

Intrahepatic obstructive jaundice results from a diffuse hepatitis (4 10 14) which causes edematous occlusion of the small bile canaliculi of the liver. The effect of such occlusion is partially to obstruct the ducts in the same manner as the stone in the extrahepatic system. Bile pigments pile up behind the obstruction and result in an increase of the obstruction. Intrahepatic obstructive jaundice is always incomplete. The etiology of such jaundice may be divided into six groups (1) Viral—catarrhal jaundice usually follows an upper respiratory infection in a young adult and is of approximately 30 days duration. It is characterized by progressive jaundice for about 21 days followed by rapid regression in about 10 days. (2) Drugs—the widespread use of sulfonamides both externally and intraperitoneally is responsible for this type. It is usually seen with massive overdose of the drug such as results from intraperitoneal implantation in the presence of a partially impaired liver. The halogen derivatives may also be responsible for this type of jaundice, anesthetic agents and hypnotics being the most frequent causative agents. (3) Bacterial—this is most commonly the re-

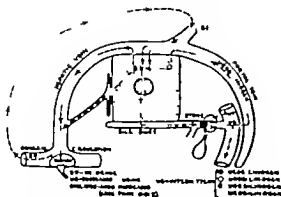


Fig. 1. Diagram showing normal bile salt distribution.

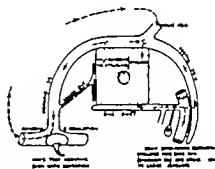


Fig. 2. Diagram showing normal bile salt distribution.

sult of a diffuse ascending cholangitis (4) Spirochetel-Weil a disease with its two causative organisms icterohemorrhagica and canicola, is the example of this. (5) Neoplasms—diffuse primary neoplasms of the liver are rare and therefore an unlikely cause but metastatic neoplasms or diffuse leucemic infiltrations may result in such a picture. (6) Hepatic congestive heart failure if severe and longstanding may produce this type of jaundice.

The Van den Bergh reaction in intrahepatic obstructive jaundice is indirect early due to an increase of bilirubin I pigments but it later changes to a delayed direct or biphasic reaction. The urine has bile, and bile salts may be increased. The urobilinogen content is increased (12) or normal. Schmidt's test on the stool vary from day to day due to the variation in the degree of obstruction of the bile canaliculi. The average case will show a sequence as follows: 3 or 4 positive reactions, 1 negative reaction, 2 more positive reactions, another negative reaction. There is an impairment in galactose tolerance with a resultant excretion of 4 to 5 grams in 5 hour period.

Extrahepatic obstructive jaundice may be due to stones, strictures, or neoplasms located in the hepatic ducts, the common hepatic ducts, the common duct or the ampulla. If complete obstruction is present in extrahepatic jaundice, there is a 95 per cent chance that the cause is a neoplasm either in the common duct, ampulla or head of the pancreas. Such a case has only a 5 per cent chance of

being a stone. In a case with incomplete obstruction the chances are that 95 per cent of the time a stone is the etiological agent in 5 per cent of such cases, a neoplastic obstruction may be the cause (15). Neoplastic obstruction of this type is usually due to direct extension from a carcinoma of the stomach or colon. The primary question in diagnosing this type of jaundice is—"Is the obstruction complete or incomplete?" To determine this point we must again fall back on our laboratory studies. The Van den Bergh reaction in both cases will be immediate direct but the amount of bilirubin in the incomplete obstruction is usually below 10 milligrams per cent whereas in the complete, it is generally above 10 milligrams per cent. In the complete, the Schmidt's tests on the stools will be consistently negative in the incomplete, they will vary from positive to negative depending upon the position of the obstruction. Examination of the urine in both cases will reveal bile but there will be absolutely no urobilinogen in the urine in the complete obstruction. The urobilinogen will vary from day to day in the incomplete types.

Figures 2, 3, 4, 5 represent in diagrammatic form the normal and altered physiology of the bile pigments and the bile salts in complete and incomplete obstruction. The diagrams are self-explanatory; the arrows representing the course of the pigments and bile salts under normal and abnormal conditions. It can be seen in the diagrams that the conjugation of the bile salts in the liver cell is dependent upon the available glycine.

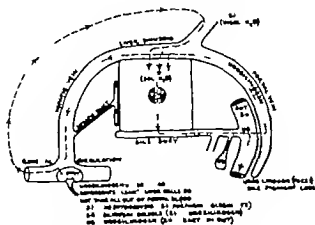


Fig. 4. Normal circulation bile pigment.

In conclusion the pertinent data from 5 recent ward cases are presented together with the completed scheme of differential diagnosis in each case. In each of these cases the diagnosis was verified by operation or postmortem examination.

CASE 1. Painless jaundice of 2 weeks duration liver palpable and smooth soft palpable spleen urine negative for bile positive for urobilinogen 1/120 Schmidt's positive 4 times, Van den Bergh delayed direct, serum bilirubin 2.8 milligrams per cent, hemoglobin 8 grams, red blood cells 3.00 with many small irregularly formed cells, fragility test normal normal hemolysis titer galactose tolerance test 3 grams in 5 hours.

The primary diagnosis in this case is nonobstructive jaundice. Next, the physiologic group in nonobstructive jaundice which best fits this case must be determined. Since the galactose test is normal it can be assumed that the liver is functioning satisfactorily. This case therefore falls into the group with a normal liver but increased red blood cell destruction rate. The causes of this type of jaundice are (1) hemolytic icterus which may be divided into two types: congenital—with the high titer of specific hemolysin and the fragile red cell toxic with the normal red cell and hemolysin titer (2) hemosiderosis may be diagnosed by taking a skin biopsy and staining for the Prussian blue reaction, (3) pernicious anemia may be diagnosed by the blood picture, bone marrow smears, and response to treatment. The most likely diagnosis in this case is, therefore, toxic hemolytic icterus.

CASE 2. Painless jaundice of 5 days duration, liver large, soft and tender spleen not palpable, heart and lungs normal urine positive for bile and urobilinogen in dilutions of 1/60 Schmidt's positive 5 times direct Van den Bergh, serum bilirubin 8 milligrams per cent, red blood cells 3.75 hemoglobin 60 per cent galactose tolerance 5 grams in 5 hours.

The primary diagnosis of this case is obstructive jaundice. The physiologic group is determined by

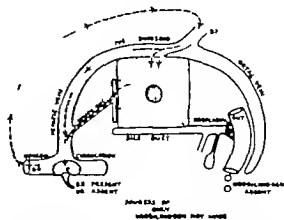


Fig. 5. Bile pigment circulation complete obstruction (neoplasm).

the presence of bile in the stool and is obviously the incomplete. Next we must determine whether this incomplete jaundice is extrahepatic or intrahepatic in origin. Since the galactose test shows impairment indicative of liver damage, we can assume that the jaundice is of intrahepatic origin. The most likely diagnosis is, therefore, incomplete intrahepatic obstructive jaundice that is hepatitis.

CASE 3. Painless jaundice of a weeks duration moderate dyspepsia small palpable mass in midline above the umbilicus, urine positive for bile and urobilinogen 1/40 dilution Schmidt's 1 minus and 3 pluses 4 plus occult blood in stools, Van den Bergh direct, serum bilirubin 8 milligrams per cent, red blood cells 3.75 hemoglobin 60 per cent, galactose tolerance test 3 grams in 5 hours, x ray films showed absent peristalsis in pyloric region of stomach.

The primary diagnosis of Case 3 is obstructive jaundice. The physiologic group determined by the presence of bile in the stool is the incomplete. Since the galactose test is normal we assume this jaundice to be of extrahepatic origin. Because it is extrahepatic, there is 95 per cent chance of it being a stone and 5 per cent chance of it being a neoplasm involving the duct system in some way. In view of the occult blood, the palpable mass and the persistent pyloric x ray defect, the diagnosis of an extrahepatic incomplete obstructive jaundice due to carcinoma of the stomach with secondary involvement and obstruction of the right hepatic duct was made and verified by autopsy.

CASE 4. Painless jaundice for 5 days duration hematemesia 2 times, liver and spleen not palpable, urine negative for bile, contained urobilinogen 1/160 dilution Schmidt's test positive 3 times, Van den Bergh direct, serum bilirubin 5 milligrams per cent, red blood cells 4.60 hemoglobin 40 per cent, galactose tolerance test 5 grams in 5 hours, normal fragility test and platelet count.

The primary diagnosis of Case 4 is nonobstructive jaundice. The physiologic group as determined by an impaired galactose test and a normal fragility test is that group with the impaired liver and normal red blood destruction rate. The cause of this type of

jaundice is usually a severe terminal portal cirrhosis. The diagnosis in this case was, therefore, terminal portal cirrhosis in atrophic phase with esophageal varices. The direct Van den Bergh reaction resulted in this case from an increased concentration of bile salts in the blood stream due to failure of the impaired liver to handle the bile salt circulation properly.

CASE 5. Painless jaundice of 3 weeks duration liver and spleen not palpable urine positive for bile 4 times negative for urobilinogen stool negative for bile 6 times Van den Bergh direct serum bilirubin 17 milligrams per cent urine grossly bloody on one occasion cystoscopic and pyelogram examination negative except for trigonitis, galactose tolerance test 3 grams in 5 hours.

The primary diagnosis in this case is obstructive jaundice. The physiologic group as determined by the presence of bile in the urine and the absence of bile in the stool is therefore the "complete." The galactose tolerance test is normal therefore this is a case of extrahepatic complete obstructive jaundice and has a 95 per cent chance of being a neoplasm involving the duct system and a 5 per cent chance of being a stone. The urinary bleeding ceased upon the administration of vitamin K. Subsequent operation and biopsy proved the lesion to be carcinoma of the lower third of the common bile duct.

SUMMARY

A simplified method for diagnosis of jaundice based on common easily performed

laboratory examinations is presented together with several cases to illustrate how the method may be applied to a given case.

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EDITORIAL

SURGERY Gynecology and Obstetrics

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OCTOBER, 1947

RADIATION INJURIES

INJURIES incurred by physicians working with the roentgen rays or radium in the early days were so much publicized that nearly every case was known and discussed. Nowadays with the greatly augmented number of physicians and assistants administering x ray therapy and participating in x ray diagnostic work the much larger percentage of injuries sustained remain almost unheralded. The importance of recognizing and avoiding these dangers from irradiation is not given sufficient emphasis. Surgeons can testify to the increasing number of physicians and dentists for whom they are called upon to repair irradiation damage to hands, and yet these injuries include only a part of the extensive category of damages which radium and x rays may cause.

The surgeon who employs the fluoroscope as an aid in the removal of foreign bodies or in the adjustment of malapposed fractured bones, unless especially trained in radiology

subjects himself and his colleagues as well as the patient to danger of dermal injury to say nothing of systemic damage to the blood making organs and especially of damage to the leucocytes. We find physicians even specialists in radiology who have suffered as a result of self administered irradiation. The writer recalls very well a surgeon who treated his own hand with radium with resulting irreparable radium injury malignant degeneration and finally miserable death from pulmonary metastases. Another well known radiologist of vast experience permitted himself to continue to assist in the adjustment of fractured bones and in the removal of foreign bodies under x ray control until his own hands developed advanced skin damage, with subsequent malignant degeneration and fatal pulmonary metastases. The young physician just graduated from medical school and internship who succumbs to the importunities of the salesman of x ray equipment and buys his own fluoroscope for use in his office may yield to the temptation to use the x rays in fluoroscopic management of fractures or foreign bodies. Unless he takes proper precautions he is likely within a couple of years, to suffer such damage to his hands that he will need extensive plastic surgery with replacement of skin of the injured members. Even veterans in radiology who have always used leaded gloves and palpating spoons often find themselves with degenerating skin damage requiring plastic surgery in order to save their lives, to say nothing of relieving the constant pain caused by the chronic x ray injuries.

It is possible to make reasonably safe use of the x rays for all of these purposes. For the removal of foreign bodies under the fluoro-

scope an accumulated time of 10 minutes at 3 milliamperes will emit the maximum radiation which should be utilized in any given case and no one, surgeon or radiologist should participate in such operations any oftener than occasionally certainly not routinely.

There are numerous ways of accomplishing satisfactory removal of foreign bodies by other than fluoroscopic means in fact, it is now often possible to substitute for potentially dangerous x ray methods the use of electronic or telephonic foreign body finders. Radiologists should be among the first to urge the adoption of these non radiological methods because they offer a means of by passing the danger inherent in the x ray method.

Every piece of diagnostic equipment used for fluoroscopy should have a built in protecting filter of 10 millimeter of aluminum or its equivalent and under no circumstances should this be removed. The size of the field of illumination on the screen should be reduced to the very minimum. Long handled forceps should be employed. The image of the bones of the hands of the operator or radiologist should never be seen on the fluoroscopic screen. The roentgen tube should never be activated even for a second unless the observer's eyes are focused upon the screen ready for instant observation and in no case should the apparatus be excited until after the observer's eyes have been thoroughly adapted to the dark.

The insidious character of the dangers resulting from small repeated exposures to x ray and radium is one important explanation of failure to take protective precautions. The direct injury to the cellular structure of the surface of the hands is usually not evident until months or even years after exposure.

It has been said that the three most important protective devices for the operation of x ray equipment and for the use of radium are

training, common sense and experience, and the most frequent causes of injury are carelessness and ignorance. We are told that between 1919 and 1935 there were seen at the Mayo Clinic 135 physicians with x-ray injuries, of whom 91 contracted their injuries during fluoroscopic fracture reduction. Of these 78 admitted failure to take protective precautions, and 11 confessed that they kept the use of protective gloves only after sustaining the injury.

The foregoing remarks relate principally to damage to the hands, but other systemic dangers threaten the radiologist. These dangers are all the more threatening to the physician who owns x ray equipment and without adequate training undertakes to use it occasionally especially for fluoroscopic work. No one can suppose for a moment that fluoroscopy gives adequate information except in a rather limited field as, for instance, in the examination of the chest.

The fluoroscope shows the excursion and the relative height of the phrenic cupolas, the condition of the phrenic angles, the mobility of the heart in relation to the diaphragm, the esophagus, and gross lesions of the chest. It is impossible for even the most expert and the most experienced to see as much tissue detail in the fluoroscope as can be seen on the films. The fluoroscope can never take the place of the films. It does, however, supplement the film study in an indispensable manner. Fluoroscopy gives information as regards the size of the heart and the movements of the walls of the different chambers of the heart. The pulsations of the aorta and of vascular tumors can be studied and differential diagnosis made in some cases although the absence of pulsations does not mean that a certain shadow is not due to a vascular tumor and the presence of a pulsation does not mean that the tumor is of the aorta. Transmitted pulsations are dif-

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difficult to differentiate from intrinsic pulsations.

It might be assumed that radiologists are so conscious of the hazards of their specialty that they do not need to be reminded of these dangers but a survey of forty five hospitals¹ showed that both radiologists and technicians receive considerably more radiation during fluoroscopy than they were aware of. These exposures were the most excessive noted in the survey. Cutaneous effects varying from

atrophy of the skin to the formation of epithelioma were noted in 20 per cent of the radiologists seen in the hospitals of this survey.

The remedy for this deplorable frequency of x ray damage lies in education. The radiologist should know better. Others such as general surgeons and especially gynecologists, urologists, and dermatologists as well as dentists should make a special study of radiation physics before attempting to employ x ray apparatus or radioactive substances.

JAMES T. CASE

¹Scheele L. A. and Cowie D. B. J. Am. M. Ass. 94: 17
538-59

THE SURGEON'S LIBRARY

REVIEWS OF NEW BOOKS

AN excellent and concise review of the author's long experience following scrotal circulation studies and surgical treatment of varicoceles with symptoms is presented in *Varicocele semiologia* by Bernardi. The author credits Ivanissevich with correcting misconceptions and teachings of previous writers in regard to the venous circulation of the male genital organs. By the use of phlebography the author was able to show for the first time the anastomosis of the anterior and posterior venous systems in cases of large varicoceles. The anatomy of the return venous circulation and the preoperative and postoperative results are very well illustrated in this volume.

Under semiology of varicocele the author discusses scrotal elongation, scrotal measurement, recognition of the posterior venous ectasia, palpatory maneuver for the anteroposterior venous communication, recognition of the spermatic artery and palpatory classification of varicoceles.

The author carefully reviews the anatomy of the inguinal canal and finds its average length only 3 to 5 centimeters rather than 4 to 5 centimeters and the internal orifice of the canal is usually found 1 centimeter above the crural arch. A 3 to 4 centimeter skin incision beginning a fingerwidth above the external inguinal ring is described. The external oblique is incised and by palpation the internal ring may be recognized beneath the aponeurosis. The technique of opening the tunica fibrosa, identification and division of the internal spermatic vein and all its associated trunks are well described in detail. Venous trunks, no matter how small should not be over looked at the time of operation. Abdominal pressure may distend and help visualize the smallest veins by reflux.

The author states that ligation of the spermatic trunks at the internal orifice of the inguinal canal constitutes a direct and causal treatment of varicocele. Section and ligation produce a slow and progressive reduction of the dilated vessels with absolute disappearance of the reflux. If reflux persists the patient is not cured in the strict medical sense even though the symptoms have been improved. Bernardi sincerely believes that no other procedure is capable of providing at one and the same time so high a percentage of cures and greater simplicity and security in its execution with such absolute respect for the spermatic artery and the gland as the one mentioned in this compendium.

This volume is an excellent reference covering of the newer concepts of simple varicoceles. The surgical technique for division of the inguinal spermatic vein is well illustrated and described.

LEONARD W. EN

THE well known treatise on endocrinology first appeared in 1941. *Essentials of Endocrinology* by Grollman has been revised and largely brought up to date. The current edition is characterized by the same excellent features that were widely recognized when the book first appeared. It is such up of a systematic discussion of each of the recognized endocrine glands in their anatomical, physiological, chemical, pathological, and clinical aspects. The author has been primarily concerned, it would appear, to produce a book that would be useful to clinicians though it is also valuable for laboratory investigators. It is probable that only the latter will have such occasion to take issue with the author and the discrepancies will be few and mostly of no great moment.

Less than justice has been done to recent brilliant studies of the thyrotropic hormone and its influence on the intimate enzymatic processes in the thyroid gland as brought out by such students as Despey-Salter and Chalkoff. The newer work utilizing radioactive iodine as a tracer substance is also inadequately considered. The older work of Cannon on the emergency function of the adrenal medulla is again mixed with a perfunctory nod. The cortex of the adrenal fares little better. Grollman still persists in the now rather unique opinion that this structure forms but a single hormone despite the fact, which he cites, that at least three categories of effects of cortical deficiency are clearly evident and that active fractions of cortical extract are known selectively to influence these processes. The important adaptive function of the adrenal cortex in relation to stress is inadequately treated as is that structure as an accessory sex organ. Throughout the book an occasional impatient phrase is substituted for adequate judicial consideration of the pineal gland is a case in point. The discussion of the pineal gland is a case in point. Another feature that is annoying at least to those readers who are interested in the "who's who" aspect of the subject, is the common relegation of a few of the authorities cited to the bibliography.

One of the unique features of the book is an especially good interpolated chapter on the hypothalamus.

ESSENTIALS OF ENDOCRINOLOGY. By Arthur Grollman, Ph.D. M.P. F.A.C.P. and ed. Philadelphia, London, Montreal J. B. Lippincott Co. 647

REVIEWS OF NEW BOOKS

in relation to clinical disorders that suggest, but have not been shown to be endocrinopathies. The possibility was overlooked however that these disorders may be due to hypothalamic influences transmitted humorally to the anterior pituitary, as Long has suggested in relation to thyrotropin discharge.

The illustrations are nearly all well selected and a considerable proportion of them are original. The proofreading has been ably competent. So logically has it been organized, and so adequate are the headings, that the vast wealth of incorporated material is easily accessible. Altogether the book is recommended as one of the best in this difficult field.

ROY G. HOSKIN.

In a book of 416 pages entitled *Synopsis of Operative Surgery* the author H. E. Mobley presents surgical procedures covering all systems and regions of the body. There are many illustrations, most of which are of the schematic form used in older texts. The descriptions are oversimplified and lacking in detail necessary for students or less experienced surgeons. There is, however, much useful information and many worth while helpful suggestions.

ROSELL T. BOWNE.

THE well prepared monograph *Penicillin Therapy* by John A. Kolmer is a very timely contribution for the practicing physician as well as the medical and surgical specialist in an era characterized by such rapid advances in the field of chemotherapy. The author has reviewed the voluminous literature on this subject and has concisely summarized the most important contributions which have been made. The book is largely written from a clinical standpoint and the major portion of it is concerned with the clinical phases of practical penicillin therapy including available methods and routes of administration. Other chapters deal with the history, production, methods of assay and properties of penicillin and streptomycin.

Detailed descriptions of the methods for measuring the concentration of chemotherapeutic agents in the various body fluids and for determining bacterial susceptibility should be very valuable to the medical technician. The established principles of therapy with penicillin, streptomycin, and other antibiotics are discussed. In summarizing the experiences of others the author often quotes conflicting viewpoints which may tend to confuse the reader somewhat, although a detailed and acceptable plan of treatment is always given for each disease. The book is well arranged adequately illustrated and well edited. Each chapter is followed by a complete annotated bibliography. It should be valuable not only as a reference book, but also as a practical guide to effective chemotherapy.

W. A. ALSTERMEYER.

SYNOPSIS OF OPERATIVE SURGERY By H. E. Mobley M.D. F.A.C.S. 1st ed. St. Louis: The C. V. Mosby Co. 647 pp. 1947.
PENICILLIN THERAPY By John A. Kolmer M.D., M.D. Dr. F.H. Scott M.D. L.H.D. F.A.C.P. and ed. New York, London: Appleton-Century Co. 1947.

THE author of *Dr. Samuel Guthrie Discoverer of Chloroform* had prepared a short paper about the almost forgotten discoverer of chloroform and thought it worthwhile to bring together what little was known about this man and his work. The result is a small volume depicting Dr. Samuel Guthrie as a pioneer physician and a scientific investigator of unusual intelligence and of varied interests.

Footnotes and collateral notes, placed at the end add items of interest to the story. In the appendix are reproduced a few family papers and several papers from the *American Journal of Science and Arts* 1831-1833 which contains all of the contributions of Dr. Guthrie. Numerous illustrations are included in this attractive book which will be enjoyed by those interested in the history of anesthesia, the development of firearms and in the life in remote settlements of a century ago.

MARY FRANCES POT.

FOR the past few years it has been increasingly difficult for the practicing physician as well as all other scientists who are not working in the field of blood grouping and blood antibodies to keep abreast of the literature and the developments related to the new Rh blood type and to know what information is really fact and which papers are theoretical and often merely confusing. A good review of the subject and particularly of the literature is therefore a great help to any physician with transusions and to obstetricians who may encounter Rh incompatibility as a serious complication of otherwise normal gestation. The new review by Edith Potter fills an important need in medicine. It offers a comprehensive review of the literature up until November 1946 and in general separates the good from the bad in this very much confused field. The chapters on pathology, clinical diagnosis, and course of the disease and the illustrations in the book are particularly worth referring to. The details of postmortem examinations of the newborn can suffer from hemolytic disease of the newborn can not be found in as complete and clear fashion in any other monograph or book on this subject. This volume can therefore be recommended to all readers of *SURGERY GYNECOLOGY AND OBSTETRICS* without reservations regarding it.

LOUIS K. DIAMOND.

THE seventh edition of Buchanan's *Manual of Anatomy* is the American form of the guide which first appeared in 1906. The original work was written by A. M. Buchanan Professor of Anatomy in Anderson College, Glasgow. The current revision is the fourth in the edited series, and the first done by Professor F. Wood Jones and five of his colleagues at the University of Manchester.

DR. SAMUEL GUTHRIE, DISCOVERER OF CHLOROFORM. By J. E. Fawcett. Washington: The Riverway Press. 647 pp. 1947.
THE ILLUSTRATION TO CONTEMPORARY HEMATOLOGY. By Edith L. Potter M.D. Ph.D. 1947. 176 pp. 1947.
THE YEAR BOOK OF ANATOMY. 1947. Edited by F. Wood Jones. Chicago: The Year Book Publishers, Inc. 647 pp. 1947.
BUCHANAN'S MANUAL OF ANATOMY. 7th ed. (London). M.P. 8.5. Jones, F. Wood Jones, M.D., F.R.C.S. (Eds.). Baltimore: Williams & Wilkins Co. 1947.

SURGERY GYNECOLOGY AND OBSTETRICS

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The opening chapter deals very helpfully with terminology and topography, the second with development and growth, the third through the sixth with skeletal anatomy. The next six chapters are arranged on regional basis: they present the gross structure of the upper extremity, lower extremity, abdomen, thorax, head and neck. These regional accounts are followed by three sections on the nervous system and the organs of special sense. A serviceable glossary follows, the latter succeeded by the terminal section on biography—offering notes on anatomists whose names appear eponymously in the manual's text.

The regular chapters (i.e. the text material exclusive of glossary, notes, and index) cover more than 1500 pages. They present amply all of the expected information on gross anatomic structure. However the treatment of musculature does not equal that by the late Professor Bardeen in the Jackson edition of the *Morris* the account of the vascular system suffers by comparison with that by Professor Patten in Schaeffer's edition of *Morris' Human Anatomy* (likewise regional in pattern) outranks that of Buchanan's *Manual*.

The book is illustrated with 847 uncolored figures prepared from simple line drawings, and 48 recent photograms. Some of the line drawings, deleted from predecessor editions, have been restored. 180 new drawings of similar character were borrowed from Professor Jones' volumes on the hand and foot. In

the preface, these drawings are described as being "beautiful" as well as clear. That they possess clarity is uncontested; however, were a reviewer carelessly to admit that these illustrations are beautiful, he would be obliged to employ artificially broad terms in describing the eminently better figures of Cunningham's *Text Book and Manual*, those which used to appear in the excellent German editions of the *Spalteholz Atlas*. The pictures of bones—always undramatic—are adequate. The drawings of the muscles are generally satisfactory although those depicting the deep antibrachial muscles, the fascial coverings and compartments of the palm, the synovial sheaths of the extensor tendons, the interosseous hamstrings, and the anterior crural muscles are of the sort that one would expect to find in any ordinary compendium. The portrayal of perineal anatomy is not only poor but incorrect; the pictorial treatment of the inguinal region is stylized, as is that of abdominal, pelvic, and thoracic viscera.

The only essentially new features are the x-ray plates. The text is standard, the numerous descriptive legends are not highly descriptive. However, despite the fact that the volume does nothing novel and discharges its pedagogic obligation without use of distinctive text or of an exceptional series of figures, it might prove a desirable adjunct to a student's or a practitioner's library.

BURY 1937.

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SURGERY GYNECOLOGY AND OBSTETRICS

Supplement

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COLLECTIVE REVIEW

THE TOXEMIAS OF PREGNANCY

With Emphasis on the Present Modes of Therapy

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IN 1940 The American Committee on Maternal Welfare (20) adopted a new classification of the toxemias of pregnancy attempting to differentiate the conditions which are present before pregnancy occurs but which may be aggravated by pregnancy from those which are initiated by and are peculiar to pregnancy itself. Using this classification of the toxemias of pregnancy Williams and Weiss reviewed 1,790 maternal deaths, finding 318 due to toxemias which they analyzed as follows:

- Group A Diseases not peculiar to pregnancy
- 1 Hypertensive disease (hypertensive cardiovascular disease)
 - a Benign (essential) mild severe 13
 - b Malignant 3
 - 2 Renal disease
 - a Chronic vascular nephritis or nephrosclerosis 10
 - b Glomerulonephritis
 - 1 Acute 3
 - 2 Chronic 10
 - c Nephrosis
 - 1 Acute 1
 - 2 Chronic 0
- Group B Disease dependent on, or peculiar to pregnancy
- 1 Pre-eclampsia
 - a Mild 0
 - b Severe 63
 - 2 Eclampsia
 - a Convulsive 143
 - b Nonconvulsive (that is, coma with post mortem findings typical of eclampsia) 13

From The Goodrich General Hospital.

- Group C Vomiting of pregnancy 37
Group D Unclassified toxemias 13

THE DIFFERENTIAL DIAGNOSIS OF THE TOXEMIAS OF PREGNANCY

Hypertensive and renal disease are usually present before the twenty-fourth week of gestation whereas pre-eclampsia and eclampsia appear after that week (31). Essential hypertension may first become apparent during pregnancy and may subside between pregnancies, at least to some degree (102). If the parturient is seen for the first time during the last trimester with toxemia, a correct diagnosis may be impossible at that time. Postpartum examination of the nephritic individual will show evidence of kidney damage (107) whereas the kidneys of the pre-eclamptic or eclamptic patient rapidly return to normal soon after delivery (31, 94). Albuminuric retinitis, when it occurs, is proof of the existence of chronic nephritis (76) therefore the value of examining the ocular fundi of the toxemic patient is obvious.

Tenny and Parker state that the degree of albuminuria is the most reliable sign as to the severity of the toxemia. Essential hypertension per se causes little if any proteinuria. Sharkey and Hess report 115 cases of essential hypertension complicated by pregnancy of which 52 showed mild albuminuria and 63 showed no albuminuria.

The diagnosis of the type of toxemia present is of some importance. Pregnancy complicating chronic hypertension associated with cardiovascular or renal degeneration offers a bad prognosis for both mother and baby. Intrauterine death

of the fetus is common. If the mother can be carried to the thirty-second week of gestation cesarean section may save the life of the infant. Dieckmann (34) states that 21 per cent of his patients with vasculorenal disease were delivered by cesarean section. Essential hypertension and mild pre-eclampsia offer a good prognosis for mother and baby.

THE INCIDENCE OF THE TOXEMIAS OF PREGNANCY

The incidence of all toxemias of pregnancy from various sources is given as 5 per cent (33) from 5 to 7 per cent (79) from 6 to 9 per cent (28) and 14 per cent (93). The great majority of these toxemias fall in the mild category (25, 32, 44, 45).

TOXEMIAS AS A CAUSE OF MATERNAL DEATH

About 20 per cent of all maternal deaths are due to the toxemias of pregnancy (84, 85). The importance of preventing eclampsia is revealed by the fact that the mortality rate of mild toxemias is practically nil while 'The appearance of convulsions increased the maternal mortality rate almost ten times' (35). It is a well recognized fact that pre-eclampsia has a low maternal mortality rate, while eclampsia carries a very high death rate for both mother and baby (35, 44, 45, 59).

The maternal death rate from eclampsia is reported as being from 10 to 20 per cent (59), 13 per cent (35), 20 per cent (28) and 23.5 per cent (56). In recent years there has been a remarkable decrease in maternal deaths from eclampsia because of conservative treatment superseding operative treatment and accouchement forcé (86). Arnell and Watson have reported 151 consecutive cases of eclampsia without a maternal death, employing 'an ultraconservative plan' of treatment. Cooke has seen 304 cases of eclampsia with only 1 maternal death while Emge wrote me that it has been 10 years and longer since he has seen a death from eclampsia.

THE INCIDENCE OF THE VARIOUS TYPES OF TOXEMIAS (32)

Type	Dieckmann	Seawery	Kallgren
Pre-eclampsia	36%	28%	57%
Vasculorenal disease			
Hypertensive disease	11%	31%	
Nephrosclerosis	%		
Glomerular		7%	
Nephritic, acute	2%		
Eclampsia	4%	4%	2%

To illustrate this decrease in maternal mortality from eclampsia the following is quoted from Eastman and Whitridge:

THE INCIDENCE AND MATERNAL MORTALITY AT JOHN'S HOPKINS HOSPITAL, 1896-1941

Period	Method of treatment	Cases	Maternal
1896-1905	Prior to 1912 therapy was governed by the belief that immediate delivery was imperative. Consequently no cesarean section forcé.	32	25
1906-1915	Mildness of the toxemia and conservative treatment were the favored procedure of that time.	51	25
1916-1925	An effort to be more conservative developed, but if the case was severe, radical operative delivery was effected.	39	11
1926-1935	A modified Strout's regime—no accouchement forcé, the occasional use of cesarean section.	127	15
1936-1941	Conservative treatment individualized. Free, liberal use of hypotensive drugs intravenously.	99	1

Novy reviewed 115 cases of eclampsia treated prior to 1932 by cesarean section and accouchement forcé, with a mortality rate of 23.5%, and 59 cases treated between 1930 and 1938 by bedrest, rest, isolation, and hypertonic glucose given intravenously with a mortality rate of 5.1%.

THE EFFECT OF TOXEMIA OF PREGNANCY ON THE FETUS

Brown, Lyon and Anderson state that 5 per cent of normal white mothers have premature deliveries, and 7 per cent of those with mild toxemia, 27 per cent of those with severe toxemia, and 38 per cent of those with eclampsia have premature deliveries.

Davis reviewed 642 consecutive premature deliveries. She found 'Although toxemias are a major cause of prematurity, they are so likely because of their associated high incidence of induced or artificial delivery before term, intrauterine death of the fetus, premature separation of the placenta, hydramnios, and twins. The toxemias of pregnancy were associated with 30.7% of the dead born, macerated group. Of the various types of toxemias, renal disease had the highest fetal mortality rate, 30.3 per cent, and the lowest fetal survival rate 48.5 per cent.'

Eastman and Steptoe record a decline in fetal mortality at The Johns Hopkins Hospital as follows:

	Maternal Deaths	Fetal Deaths
1924-1928	11 0%	40 10%
1929-1943	5 7%	30 1%

history and urinary findings are usually sufficient. Albuminuric retinitis, when present, is positive proof of the existence of chronic nephritis (74).

The deleterious effect of this disease upon the mother and fetus has already been shown (26, 28, 100, 115, 124). It is best, in proved cases, to empty the uterus by dilatation and curettage, by rupture of the bag of waters, or if the fetus is viable, by induction of labor or cesarean section (21, 25, 28, 45, 81, 100). The patient should be sterilized (28, 34).

DISEASES DEPENDENT ON OR PECULIAR TO PREGNANCY

THE CAUSE OF THE TRUE TOXEMIAS OF PREGNANCY

A great many theories have been advanced in the past as to the cause of the toxemias of pregnancy (31, 116, 64) but its cause is still unknown. Vasospasm, and sodium and water retention are believed to cause the disease (25, 28, 30, 36, 35, 31, 43, 44, 51, 57, 59, 77, 84, 82, 105, 106, 111, 121, 125). Associated factors are primiparity, multiple pregnancy, hydatidiform mole, and hydramnios (18, 28, 32, 59, 107).

Goldblatt clamps applied to the renal arteries of pregnant dogs and rabbits produce within 48 to 120 hours, after a relatively slight constriction weakness, basitude, hypertension, convulsions, albuminuria, and nitrogen retention (18). However pregnancy occurring in experimentally made by pertensive rats (89) and dogs (22) causes a fall in the blood pressure to normal.

Pyelitis of pregnancy does not cause toxemia. Mussey and Lovelady at the Mayo Clinic reported 117 cases of pyelitis of pregnancy, only 3 of which developed toxemia of pregnancy. Among 163 cases of toxemia there were only 6 cases of pyelitis of pregnancy (83).

Fuster has produced eclampsia in a nontoxicemic primigravida by the intravenous infusion of 800 c. c. of a 10 per cent solution of saline.

Restriction in weight gain is very important during pregnancy. Odell Lester and Mengert found that of 641 women who weighed over 200 lb. before delivery, 31.4 per cent had toxemia of pregnancy. Other complications of pregnancy and delivery occurred more frequently in this group of obese patients. Loughran reviewed the records of 325 women who had been placed on a high protein, low carbohydrate, high vitamin diet and whose weight gain during pregnancy had been kept below 20 lb. Any edema developing during the last part of pregnancy was treated by increasing the protein intake and decreasing the salt in the diet. These women all fared better than the aver-

age and had remarkably short labors. Lusk advises that the weight gain during pregnancy be restricted to 16 pounds as a maximum, or not more than 2 pounds in any month. He presented 1000 patients, who were of normal weight at the beginning of pregnancy and whose weight gain during pregnancy had been restricted to 16 pounds. They had been given a high protein, high vitamin, low salt diet with salt restriction if edema developed. In this group there were no toxemias, no maternal deaths, a gross fetal mortality of 21 per cent, and an average birth weight for all babies of less than 7 pounds. Others (27, 35, 94) emphasize the need of restricting the weight gain of the normal woman during pregnancy to less than 20 pounds.

Parks (91) believes that the normal sodium and potassium ratio is upset by an excess of adrenocortical hormone, and suggests that the fetal adrenal glands contribute to this excess.

Toxemia is of frequent occurrence in pregnancies complicating hyperthyroidism (61). Various hormonal imbalances are being postulated as causing toxemia (105, 111) but are still speculative (92). Snyder has produced toxic abortion of the placenta in rabbits by the injection of sodium 5. The frequent occurrence of toxemia in association with hydatidiform mole (18) tends to support the opinion of those believing in an endocrine imbalance as the cause of toxemia of pregnancy.

THE PATHOLOGY OF TOXEMIAS OF PREGNANCY

The patient may injure herself during a convulsion, fracture and dislocation of both shoulders having been reported (23). Aspiration of food, mucus, food, and medicine may cause death (4). Irving (59) states that the most common cause of death is acute cardiac dilatation. Teel, Reid and Hertig state that 30 per cent of all eclamptic patients develop acute pulmonary edema. Cerebral hemorrhage (56, 93) and abortion (60) may occur. Cerebral edema is common (4).

At autopsy there is no pathognomonic lesion (1). Arteriole necrosis and hemorrhages are found in most of the organs (59, 63). Page and Cox in 24 selected autopsies following toxemia of pregnancy found a nonspecific thickening of the glomerular membranes in the kidneys.

Abruptio placenta occurs frequently (16, 32, 117) while placenta previa occurs rarely (117). There are no characteristic infarcts seen in the placenta (55, 103).

PRE-ECLAMPSIA

Pre-eclampsia is a disease peculiar to pregnancy developing after the twenty-fourth week of ges-

The future of the pre-eclamptic patient Dexter Weiss, Haynes, and Sisc state that improvement begins within 12 to 24 hours postpartum, and is associated with diuresis and loss of edema. Taylor, Warner and Welsh state that the sodium and water retention occurring during pregnancy is related to the concentration of estrogens in the body and that normally a puerperal diuresis results post partum.

According to Peckham the pre-eclamptic patient recovers within 10 to 14 days postpartum but of 343 women followed up after delivery, 40 per cent showed some sign of chronic nephritis. Browne and Dodds (14, 15) found that 50.9 per cent of pre-eclampsics have some residual hypertension. Cosgrove and Chesley, reviewing 1,615 cases of toxemia, found that the incidence of remote permanent hypertension was 53 per cent. Eastman and Steptoe show that the duration of the pre-eclampsia has a direct relationship to the persistence of hypertension postpartum.

Duration of pre-eclampsia (weeks)	Total No. patients	Per cent of residual hypertension
1-4	8	16.8
5-6	47	30
7-8	6	38.9
9-10	11	55.6
11-12	54	70.8

Irving (59) gives the incidence for postpartum hypertension as 21 per cent for mild pre-eclampsia and 4.8 per cent for severe pre-eclampsia. Others (30) also believe that severe pre-eclampsia has a better late prognosis than mild pre-eclampsia. Ryland thinks that this may be due to the tendency to terminate the pregnancy early in the severe cases.

On the other hand, Miller (77) states that 100 patients were carefully studied for 1 or more years after an attack of toxemia and no evidence of significant vascular or renal morbidity was found in those who were known to be normal prior to their abnormal pregnancy.

The advisability of future pregnancies depends upon the amount of permanent damage sustained by the vascular and renal systems (99).

ECLAMPSIA

According to Stander (108) the typical clinical and laboratory findings of eclampsia are: by pertension, albuminuria, edema, convulsions, elevated blood uric acid and decreased CO_2 combining power, decreased uric acid clearance and decreased urinary output, followed by a complete return to normal after the eclampsia.

The convulsions of eclampsia are indistinguishable from those of epilepsy (59). Convulsions occurring during pregnancy may be due to causes other than eclampsia. Arnell (5) states that of 162 pregnant women with convulsions admitted at the Louisiana Charity Hospital only 120 had eclampsia. The other 42 patients were diagnosed as having epilepsy, central nervous system affections, hysteria, diabetes, drug reactions, blood diseases, hypertensive encephalopathies, chronic renal disease, food poisoning, hyperemesis gravidarum, chorea, tetany and alkalosis.

Most cases of eclampsia are preceded by pre-eclampsia but the onset of eclampsia may be so abrupt that the prodromal signs and symptoms may be missed unless the parturient is seen weekly during the last trimester of pregnancy (45). Stander (108) reviewed 34 cases of postpartum eclampsia and found that 13 of the patients had had no antecedent toxemia.

Eastman and Whitridge state that the approach of eclampsia is heralded by

1. Severe, continuous headache
2. Swelling of the face or fingers
3. Dimness or blurring of vision
4. Persistent vomiting
5. Decrease in urinary output
6. Epigastric pain (a late symptom)

Eclampsia may be mild or severe. Dieckmann (31, 33) gives the criteria for severe eclampsia as

1. Coma
2. Temperature of 102° F or more
3. Pulse rate over 120/min.
4. Respiratory rate over 35/min
5. More than 10 convulsions
6. Cardiovascular impairment (edema of the lungs, persistent cyanosis, low or falling blood pressure, low pulse pressure)
7. Failure of treatment to
 - a. Stop the convulsions or prevent their recurrence
 - b. Produce a urinary output of at least 700 c.c. per 24 hours
 - c. Prevent the onset of or increase in degree of coma
 - d. Produce a dilution of the blood as indicated by a decrease of at least 10 per cent in hemoglobin, cell volume, or serum protein concentration

The incidence of eclampsia. Eclampsia occurs once in 500 to 800 deliveries (107, 108). Eclampsia may occur antepartum, intrapartum, or postpartum. Intercurrent eclampsia indicates a situation in which pregnancy continues for a period of time after the eclamptic patient has ceased to have convulsions (6).

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or if the cervix is not "ripe" cesarean section under spinal or local anesthesia.

Cook terminates the pregnancy if the disease is progressing. Otherwise, he waits until the fetus is mature, then interrupts the pregnancy, thus because of the rather frequent death of the fetus in utero if allowed to go to term and to reduce the damage to the kidneys which occurs steadily in prolonged cases.

Congrove and Chesley state "Thus it can very definitely be stated that prompt termination of the pregnancy in the presence of established toxemia after the thirty-fourth week of gestation serves alike and directly both the maternal and the fetal interest. It also serves to prevent fixed hypertension as a sequel of the toxemia. They recommend medical induction augmented by stripping and rupture of the membranes. In the presence of fulminant progress of the case toward ex- plosive eventuality cesarean section for delivery should be unhesitatingly resorted to."

Danforth writes that if the pre-eclamptic patient does not improve on treatment the pregnancy should be terminated. If the cervix is partially effaced with some dilatation, the membranes are ruptured if closed with no effacement, a cesarean section under local anesthesia is considered.

Dickmann (32-35) usually attempts to carry the toxemic patient to the period of viability of the fetus, to the thirty-second week of gestation. If the cervix is "ripe" the membranes are ruptured. If contractions have not begun within 12 hours after rupture of the membranes, 1 minim dose of pitocin are given every 30 minutes until labor has begun. If the cervix is unsuitable for this, a cesarean section under local anesthesia is done. He (34) delivered 11 per cent of his pre-eclamptic patients by cesarean section.

Eastman and Steptoe emphasize that prompt delivery of the pre-eclamptic patient is advisable to prevent eclampsia and the development of permanent, residual, hypertension. In 85 per cent of 510 patients with pre-eclampsia who were not in labor on admission, termination of the pregnancy ensued within 5 days in the following manner:

- 1 Spontaneous onset of labor 185 CASES.
- 2 Artificial rupture of the membranes 143 CASES.
- 3 Medical induction 37 CASES.
- 4 Cesarean section 66 CASES.
- 5 Hysterectomy 4 CASES.
- 6 Vaginal abortion 1 CASE.
- 7 1 CASE.

The incidence of cesarean section for delivery in cases of pre-eclampsia has risen from 3.0 per cent in the period from 1924 to 1928 to 6.6 per cent for the period from 1939 to 1943.

Falls, in the discussion following Haber's and Arnell's papers, stated that he had performed cesarean section in 49 cases of fulminating pre-eclampsia without a maternal death.

Irving (59) states that the pregnancy should be terminated if the patient fails to improve or if the disease progresses. Thirty-six per cent of his cases of severe pre-eclampsia were terminated in the following ways:

- a By rupture of the membranes. 23 per cent
- b By cesarean section 8 per cent
- c By other methods 5 per cent

Miller (77) states "When there is no improvement after a reasonable trial with these measures, usually one week to ten days, pregnancy is terminated by the most conservative method. This may mean medical induction, using pitocin instead of pituitrin, or rupture of the membranes. A few cases have been bagged and rarely cesarean section has been resorted to. In the last few years bagging has practically dropped out of the indications other than the toxemia, for example, cephalopelvic disproportion, previous cesarean section, placenta praevia, and other similar conditions."

Montgomery (80) treats the pregnancy similarly in the severe pre-eclamptic and the eclamptic patient. "If the patient fails to improve with this regime within 48 to 72 hours, or if she has reached the period of maximum improvement over a period of 2 or 3 weeks and begins to show recurrence of toxemia with increase of blood pressure and edema, we terminate the pregnancy by induction of labor in multiparous patients, or, more frequently by cesarean section in the primigravida."

Munsey and Hunt list the termination of pregnancy in 216 cases of toxemia of pregnancy treated at the Mayo Clinic between 1931 and 1939 as follows:

Means of delivery	No. of mothers	No. of babies	Per cent of total deaths
Spontaneous			
Medical induction	109	113	75.8
Medical induction failed	37	37	24.2
Spontaneous onset			
Medical induction failed, Artificial rupture of the membranes	9	9	10
Artificial rupture of the membranes	10	10	10
Bag induction	21	21	10
Cesarean section	14	16	33
Total	166	161	77.1

TABLE I.—ESSENTIAL DRUGS AND DOSAGES RECOMMENDED FOR ECLAMPSIA

Author	Sedatives	Magnesium sulfate	Hypertonic glucose
Allen ()		c. 5 per cent solution after first fit Repeat 5 c. I.M. after each fit until controlled.	1000 c.c. of 50 per cent I.V. or 3 times daily. From 500 to 400 c. of 50 per cent or from 100 to 200 c.c. of 30 per cent to stimulate diuresis.
Arnall (5)	Morphine sulfate (gr. 5/6) and sodium phenobarbital (gr. 5) hypodermically. If fits persist give from 3 to 6 gr. of sodium amylal I.V. or repeat the magnesium sulfate. After the attack give sodium phenobarbital (gr. 1/4 to 3/4) 3 to 6 hrs.	5 minutes later if fits are still present, give 50 c. per cent I.V. Repeat if fits recur.	500 c. of 50 per cent solution I.V. stat. and during delivery. If heart failure de- velops, 500 c. of 50 per cent, or from 50 to 100 c. of 50 per cent solution I.V.
Boston City Hospital ()	Sodium luminal (gr. 1 to 5) I.M. q. 4 hr. p. a. Paraldehyde per rectum, 1 dr. in oil. Pentothal I.V. to control fits.		100 c.c. of 50 per cent or 200 to 400 c. of 30 per cent solution I.V. or 3 times daily.
Cooke ()		gr. I.V. q. 3 hrs. until fits are controlled.	From 50 to 100 gr. in 5 or 10 per cent solution I.V.
Crofters & Chesley (5)	Morphine sulfate, (gr. 5/6) dose.	50 of 50 per cent solution q. 4 hr. as long as fits persist. Dose q. 4 hr. times after last fit, I.V.	500 c. of 5 per cent solution I.V. q. 4 to 6 hours.
Dandforth (27)	Morphine sulfate (gr. 1/6) hypo. stat. and q. to 4 hr. until fits cease or respira- tions drop to 12/min. Luminal sodium, (gr. 2) p. a.	50 of 50 per cent solution I.M. stat. c. after each fit. Not more than 50 c.c. in 24 hrs.	From 500 to 1000 c. of 50 per cent solu- tion I.V. q. 4 hrs.
Dickson (33) (35)	Luminal sodium (gr. 1) hypo. q. 6 to 12 hr. Chloral hydrate, grs. 10 to 20 c. starch water q. 6 to 12 hrs per rectum.	6 c.c. of 50 per cent solution I.M. stat. and after each fit.	1000 c. of 50 per cent solution I.V. q. or 3 times a day. From 100 to 500 c. of 30 per cent solution for heart failure.
Eastman (43) (44) (45) (46)	50 of paraldehyde per rectum stat. All eclampsias at	50 of 50 per cent solution I.M. and re- peat every 6 hrs.	100 c. of 5 per cent solution I.V. q. 4 to 6 hrs.
Hanley (33)	Chloral hydrate (gr. 50) and sodium bromide (gr. 60) per rectum.	50 c.c. of 50 per cent solution stat. and q. 4 hr. until fits stop. Not to exceed 20 in 4 hrs.	500 c. of 5 per cent solution I.V. to 4 times daily.
Huber (56)	Sodium amylal (3 1/4 to 7 1/2 gr.) I.V. q. 5 to 6 hrs.	50 of 5 per cent solution I.M. after each fit.	From 1000 to 2000 c.c. of 50 per cent solution I.V. or 3 times daily. Use 50 or 100 per cent solution for heart failure.
Irving (39)	Morphine sulfate, (gr. 1/6) hypo. or pa- raldehyde, dr. 5 in oil per rectum.	From 10 to 50 c. of 50 per cent solution I.M. q. 4 to 6 hrs.	50 c. of 5 per cent solution I.V. q. 4 to 6 hrs.
Give 5 minims of veratrum viride (veratrine) hypodermically on admission. Repeat p. a. 1 to 2 minute intervals 1/2 to 2 minims doses to keep the blood pressure below 90 systolic and pulse below 80/min; repeat if another convulsion occurs.			
Miller (77) (78)	Morphine sulfate to control fits. Bar- biturates I.V. as an alternate.		From 250 per cent solution I.V. if there is no pulmonary edema.
Montgomery (80)	Morphine sulfate (gr. 1/6 to 1/4) hypo- dermally; Chloral hydrate (from 50 to 40 gr.) per rectum; also barbiturates.	5 c.c. of 50 per cent solution I.V.	50 per cent solution I.V.
Mossey and Mossey (84)	Heavy sedation with morphine sulfate and pentobarbital (gr. 4), I.V.		Yes
Oldham (88)	Sodium amylal (gr. 1/4) I.M. As last resort, ether in oil per rectum.	5 c. c. of 5 per cent solution I.M. and repeat to control fits.	100 c. c. of 50 per cent solution I.V. and repeat if coma persists. 500 c. c. of 50 per cent solution.
Smell (90)	Morphine sulfate (gr. 1/6) q. 1 hr. until fits are over or respirations fall to 15/ min.	50 of 10 per cent solution I.V. and also I.M. 50 p. a. for fits. Not more than 80 c.c. in 24 hrs.	From 500 to 1000 c. of 50 per cent solu- tion I.V. From 100 to 500 c. of 50 per cent solution or 3 times daily.
Woodward (96)	None	10 of 50 per cent solution I.M. stat. and 3 c.c. q. 6 hrs.	500 of 10 per cent solution plus 50 c.c. of 50 per cent solution I.V.

Veratrum hypodermically (minims 3 to 5 or more) q. 1 to 3 hrs. to keep blood pressure below 120/90 and pulse rate below 80/min.

I.M. means intramuscularly
I.V. means intravenously

In 1945 Arnall (5) reported 142 cases of eclampsia treated by an ultraconservative method without a maternal death. The pregnancies were terminated in the following ways (See table at top of page 322)

Later in 1945 Arnall and Watson reported 151 cases of eclampsia, treated in a similar manner as the previously mentioned 142 cases, without a maternal death. This last report included 52 cases of intercurrent eclampsia. Intercurrent eclampsia is

The incidence of the various types of eclampsia as given by Greenhill (52) Arnell (5) Irving (59) and Whitacre (121) is given below

Author	Antepartum per cent	Intrapartum per cent	Postpartum per cent
Greenhill	20	30	50
Arnell	14	21	65
Irving	20	5	5
Whitacre	77	6	17

Postpartum eclampsia occurs most frequently during the first day of the puerperium but may occur as late as the eighth day following delivery (108).

In 1945 Arnell and Watson reported 53 cases of intercurrent eclampsia without a maternal death, the largest series on record.

The Treatment of Eclampsia The modern treatment of eclampsia is medical for reasons already cited. Stroganoff (109, 110) introduced the conservative treatment of eclampsia. Titus (115, 116) introduced the intravenous use of hypertonic glucose, and Lazard the intravenous use of magnesium sulfate. Bryant and Fleming developed the use of veratrum viride in the treatment of eclampsia. Hypertonic glucose solutions given intravenously and magnesium sulfate given intravenously or intramuscularly usually with morphine sulfate or a barbiturate, are employed by most workers in the treatment of eclampsia (2, 6, 7, 8, 9, 11, 12, 21, 25, 35, 45, 53, 59, 67, 74, 84, 88, 100, 121, 126). Some include veratrum viride in combination (51, 59, 63) (96, 121, 126). Paraldehyde is used as the principal sedative by others (12, 40, 41, 59, 63). A few workers recommend venesection when pulmonary edema develops (25, 48, 49, 77, 109, 110).

The Stroganoff (109, 110) method for treating eclampsia, in use at the present time by Kampermann and Seeley Falls, and in a more or less modified form by Stander, Titus (115, 116), Mengert and Sage, consists of the following:

1. Morphine sulfate (gr $\frac{3}{4}$) given hypodermically.
2. Chloral hydrate (from 20 to 40 gr) per rectum 1 hour later.
3. Morphine sulfate ($\frac{3}{4}$ gr) hypodermically 3 hours later.
4. Chloral hydrate (30 gr) per rectum 4 hours later.
5. Chloral hydrate (from 15 to 30 gr) per rectum 6 hours later.
6. Chloral hydrate (20 gr) per rectum 7 hours later.

The chloral hydrate is dissolved in 4 or 5 oz. of warm water and slowly injected into the rectum, the patient being given light chloroform anesthesia to prevent a convulsion which might result from the local irritation. The opportunity is used to make a rectal examination to determine the progress of labor. The patient is kept in a dark room and watched carefully. Chloroform is used to control the convulsions. If the convulsions are violent and numerous, the membranes are ruptured and venesection is performed. After recovery the patient is given from 5 to 10 gr of chloral hydrate orally t.i.d. for 3 days.

Inasmuch as Arnell and Watson have reported "151 consecutive cases of all varieties of eclampsia without a maternal death, a detailed study of their regime for the treatment of eclampsia would not be amiss. They (5, 6) attribute their success to the following features:

1. An ultraconservative concept of management (do not overtreat).
2. Constant care by a trained physician.
3. Individualized regimen.
4. Frequent change of posture, oxygen, aspiration of mucus, and an hourly observation of the urinary output by means of a retention catheter.
5. Limitation of sedation to control the fits.
6. Limitation of intravenous glucose therapy just sufficient to maintain the urinary output, return to oral glucose therapy as soon as possible.
7. Delayed delivery until recovery occurs.
8. Induction of labor by the simplest method.
9. Minimal operative procedures, local anesthesia.

The workers using the Stroganoff regimen for the treatment of eclampsia or a modification of it have already been mentioned. Stander (63) (107) (108) at the Cornell Medical School uses a modified Stroganoff regimen, laying emphasis on the treatment of any existing acidosis with sodium lactate, the intravenous use of glucose to protect the liver and to stimulate the urinary output, and conservative treatment of the pregnancy. Barbiturates are being used instead of chloral hydrate.

The recommendations of other workers for the treatment of eclampsia are given in Table 1 on page 321.

The treatment of pregnancy in eclampsia. The Stroganoff method of treatment of eclampsia entails expectant treatment of the pregnancy (4, 75, 99, 107, 109, 110, 115, 116). The bag of waters may be ruptured if the eclampsia is progressive.

Teel and Reid (112) found an incidence of hypertonism of 10.3 per cent in patients who had eclampsia and who were known to be normal before the attack

VOMITING OF PREGNANCY

Approximately 50 per cent of pregnant women develop some nausea and vomiting during the first trimester of the gestation. This usually subsides but may become pathologic and progress into hyperemesis gravidarum (28). It is, therefore, important to treat all of these mild cases of nausea and vomiting to prevent progression into the pathological state.

The cause of the nausea and vomiting of pregnancy is not known. Symptomatic treatment is usually effective. Rest, relief from household duties, abstinence from sexual intercourse, avoidance of tobacco smoke and unpleasant odors, sedatives and frequent small feedings high in carbohydrate content usually suffice (39). Vitamin B₆ (pyridoxine hydrochloride) has been reported as being very beneficial (42) (104) (118) although it has been the opinion of other authors that it is valueless (54).

Progression of the disease necessitates hospitalization and the institution of a strict program of rest, isolation, sedation, and intravenous feedings. Psychiatric help is often very beneficial (21) (39) (54).

Cosgrove and Carter (24) state that they treated 300 cases of hyperemesis gravidarum over a 10 year period with no deaths and had to perform only 1 therapeutic abortion.

SUMMARY

A review of the present concept of the toxemias of pregnancy and the methods of treatment in vogue at the present time is given. Vasospasm and sodium and water retention are characteristic features of the disease. Mild pre-eclampsia and essential hypertension carry a good prognosis for the mother and child, but severe cardiovascular, renal disease and chronic nephritis carry a bad prognosis for them. A patient with severe pre-eclampsia should have her pregnancy terminated, preferably after the fetus is viable, and the method of termination should depend upon the state of the cervix.

Cesarean section is being employed more frequently as a means of delivery in the patient with severe pre-eclampsia. Once eclampsia has supervened the best results are obtained by treating the eclampsia medically and the pregnancy expectantly.

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Method of delivery	Type of eclampsia			Percent of total no. of cases
	Ante-partum no. of cases	Intra-partum no. of cases	Post-partum no. of cases	
Vaginal delivery	7	5	37	53.7
Spontaneous delivery	6	6	20	26.6
Forceps delivery	1		6	
Breech extraction				
Version and extraction				
Embryotomy				
Abdominal delivery	3	5		6.3
Cesarean Section	3	3		
Cesarean Section and Hysterectomy				

defined as that type in which delivery did not occur for 3 or more days after the cessation of convulsions.

The methods of delivery in these 52 cases of intercurrent eclampsia are listed as follows:

Method	Time interval in days				Percent of total
	to 1	4 to 7	8 to 10	Over 10	
Cesarean section					1.6
Vaginal delivery		14			96
Spontaneous delivery	10	20		13	54.6
Forceps delivery					
Breech extraction					
Version and extraction					
Embryotomy					
Total		14	2	2	100

At the Boston City Hospital (11) it is recommended that the pregnancy be terminated after the convulsions are controlled, vaginally if possible, but by cesarean section if vaginal delivery appears to be a prolonged affair. Cooke, at the University of Texas, terminates the pregnancy after the patient is in good condition, cesarean section being used mostly on obstetrical indications. He has treated 204 cases of eclampsia with only 1 maternal death. Cosgrove and Chesley at the Margaret Hague Maternity Hospital, allow the pregnancy to proceed until the patient is in good condition when labor is terminated, preferably by medical induction. Danforth recommends that the pregnancy be treated expectantly. Dieckmann (32-35) at the University of Chicago ruptures the membranes if the patient is in labor; if the patient is not in labor the pregnancy may be terminated after 8 to 12 hours by the induction of labor or

rarely by cesarean section under local anesthesia for the progressive eclamptic patient. Eastman (44, 45-63) at Johns Hopkins University treat the pregnancy expectantly. Irving (59), of Harvard University, terminates the pregnancy within 24 to 72 hours, only after the convulsions have ceased. If the cervix is soft and dilating the membranes are ruptured. Miller (77-78) of the University of Michigan, states "After a few days when the patient's condition has definitely improved, pregnancy is terminated by inducing labor."

We do not subscribe to the idea of curing these patients for any protracted period of time after a convulsive seizure. He states that the pregnancy was terminated in 224 toxic patients in the following ways:

1. Spontaneous delivery in 63 per cent.
2. Thirty-seven per cent were terminated usually by medical induction (53%) or rupture of the membranes (14%).
3. Cesarean section was carried out in 44 per cent (10 patients) but the indications were primarily for reasons other than toxemia.

Musey and Musey (84) of the Mayo Clinic induce labor by medical induction or rupture of the membranes after the convulsions are controlled. Woodward at the University of Cincinnati, terminates the pregnancy expectantly. Allen, at Washington University, Falls (48) at the University of Illinois, Hanley at the Los Angeles County Hospital, and Montgomery (80) at the Jefferson Medical School, incline toward operative intervention if the eclampsia is progressive.

The future of the eclamptic patient. Arnold and Watson reported that of 38 patients followed from 6 months to 5 years after an attack of eclampsia, only 3 showed any abnormality. The abnormality noted was elevation of the blood pressure above 140/90 mm. Hg. and this was regarded as being due to essential hypertension.

Cosgrove and Carter (24) found that of 153 patients who had had eclampsia and were followed up for 8 years after the attack, 90 had 143 subsequent pregnancies and only 2 of these had eclampsia again.

Irving (59) states that about 10 per cent of the eclamptic patients who were normal before the attack of eclampsia developed a subsequent hypertension and about 4 per cent had another attack of eclampsia in a subsequent pregnancy.

McClellan, Strayhorn and Densen (74) reviewed 75 cases of eclampsia, and 30 of the patients were observed from 6 months to 13 years after the attack. In 32 subsequent pregnancies occurring in this group there was no recurrence of eclampsia.

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ABSTRACTS OF CURRENT LITERATURE SURGERY OF THE HEAD AND NECK

EYE

Savittali M.: The Treatment of Progressive
Phthalamus. A. 047 33 214

The author reports a case of so-called malignant phthalamus with severe intra then symptoms slight and in a mal vol n of the cases there were pregnancy in another occurred following a twin a tuberculous infection in the patient the con dition toll and se r m n t a l t r a u m a. Definite myxedema was present in case Th aphthalamus increased in all pat nt ther d rectly after thyroid ectomy several month later Th thyroidect my patient would seem to be a u o f t p r o g r e s s i v e aphthalamus.

In the patient with myxedema thyroid medication proved helpful. A a t t a i n m e n t o v e r t h e p i t u i t a r y w a h e l p f u l i n n m i d a s e. In a more severe case the condition appeared to be a t a l b e p u r e x-ray therapy and a NaCl per alutal lec representation was performed immediately. The patient recovered.

It is emphasized that this subject may should be a mild unless there is a symptom demand it. When r p e n t h i s d t a l d t h o u d b e p u r e s e b e l. X-ray treatment over the pituitary gland and in severe cases if necessary for the prevention of a m i t a l d e c o m p e n s e m a y b e c a r r i e d o u t.

Davidson, A.: Primary Lipid Dystrophy of the Cornea. Arch Ophth. Chic. 017 37 433

The author reports a case of primary lipid dystrophy with a associated hyperbosteremia. The patient at a 6 year old girl had had repeated attacks of pain in the eye and injection of the conjunctiva at intervals of about 3 months first in his left eye and then in both eyes. He had noted smoky opacity in the posterior layer of right cornea. A small area just in the lower part of the right cornea. It was a white area appearing immediately in front of December. The half thickness. There were tiny glitt gold particles in this area. There was little opacification there were no keratic precipitates. In the left eye there were a yellowish white vascularized corneal c. apparently large layers and almost completely covered except for a small area. There above and

small chalklike deposits at various depths of the stroma. There was a constant progression of the opacities in both eyes. The serum cholesterol level from 225 to 390 mgm. per 100 c.c., and a roentgenogram of the skull was negative.

A corneal transplant which was done on the left eye quickly became vascularized and opaque. Sections of the disc which were removed from the cornea showed normal epithelium, considerable vascularization and an incomplete Bowman's membrane. There were focal accumulations of macrophages with no lymphocytes. Large and small globules of fat were numerous both extracellularly and within the macrophages. Later, the cornea about the transplant showed a definite clearing and it was thought that this peripheral clearing might be the cause of the primary lipid dystrophies. The retinoblastic lesion is obscure but other cases with high blood cholesterol have been reported.

ROBERT H. JORDAN, M.D.

Leopold J. H., and Adler F. H.: The Use of Frozen-Dried Corneas as Transplant Material. J. Clin. Ophth. Chic. 1947 37 243.

The authors have carried out experimental work with frozen-dried corneal tissue in rabbits. The technique employed is described, as well as the method of freezing and rehydration. Of the 73 frozen-dried corneas used as transplants, 50 takes resulted. Of the 50 takes, 10 grafts showed corneal vascularization and 9 showed persistent corneal edema. The other 35 corneas showed no serious complication. In 7 of the 30 eyes that received fresh corneal tissue for transplants the cornea healed in place and remained transparent for the 6 month period of observation. Results indicated that frozen-dried corneas may be transplanted into normal rabbit eyes without producing unusual host reaction. It would appear that the chief cause for failure to regain transparency in the rehydration process.

HUGH H. ROWLAND, M.D.

Eight eyes were injected with commercial penicillin of which 4 were sectioned. In only 1 of these had infection been experimentally introduced. In all of the cases the fundi were damaged. There were pigmented changes which in 1 case progressed to retinitis proliferans. There was a tendency toward vascular proliferation and retinal hemorrhages. Similar but less marked changes were found with crystalline penicillin and there seemed to be no predilection for the vascular system as with the commercial preparation.

Sodium sulfacetamide was injected into 16 eyes. The maximum effect appeared only after a delay of several weeks but there was a destructive effect on the retina at the level of the rod and cone layer. One eye receiving a double injection showed retinal detachment and cystic formation within the retina. The damage in all of the cases was more extensive than when crystalline penicillin was injected.

Marfanil caused marked constriction of the retinal vessels and there was marked disturbance in the rod and cone layer.

There was also marked retinal destruction in 9 eyes in which V 335 was injected. In this instance the choroid also seemed to be largely affected but with the other material used it seemed to be only slightly involved.

A further study was made of the diffusion of drugs within both normal and infected eyes following intravitreal injection. In the infected eyes virulent hemolytic streptococci were injected all untreated cases resulting in vitreous abscess and an opaque vitreous. When penicillin was injected up to 6 hours after inoculation it prevented the development of infection, but it had no effect when infection was delayed for 24 hours. Sodium sulfacetamide prevented infection in some cases and merely delayed it in others. Favorable results were obtained with marfanil and V 335 but because of their toxic effects on the eye their action was not fully studied.

In spite of the toxic effects the authors believe that when an eye is endangered by a severe vitreous infection the use of pure penicillin by injection into the vitreous may be justified but the use of the other substances studied seems to be contraindicated because of their severe toxic effects.

WILLIAM A. MAW M.D.

Gordes F. C.: Types of Congenital Cataract. *Am J Ophth.* 947 30 397

As the third Gifford Memorial Lecture, Cordes has offered a systematic discussion of the various forms of congenital cataract. It is well known that certain forms have a hereditary tendency primarily of the dominant type but various types may appear in the same family. Other ocular abnormalities occur in about 50 per cent of the cases of congenital cataract, including strabismus, amblyopia, nystagmus, aniridia, choroidal and retinal changes, and microphthalmos.

There appears to be a definite hereditary tendency in the following types of cataract: congenital total

cataract, lamellar cataract, embryonal nuclear cataract, coralliform cataract, spear cataract, floriform cataract, anterior axial embryonal cataract, anterior and posterior polar cataract, axial fusiform cataract, stellate cataract, and disc shaped cataract.

Blomicroscopy of the lens is important in the localization of the lens opacity, which in turn reveals the time of onset of the opacity. For practical purposes the zones recognized are the embryonal nucleus (lying between the Y sutures) the portion of the lens formed before the third month, the fetal nucleus surrounding the first zone and formed in intrauterine life after the third month, the adult nucleus formed during adolescence and early adult life, and the cortex, the fibers of which are laid down in later life.

Intrauterine trauma may sometimes produce lens opacities, as seen in the reduplication cataracts. It is also known that interference with calcium metabolism and parathyroid secretion as well as avitaminosis will cause lens changes.

There has been considerable attention of late to congenital cataract following rubella in the mother during pregnancy. Sections of an eye with cataract in a 7 weeks embryo with a history of rubella in the mother during the fifth week of pregnancy indicates that the damage is done at the time of the infection.

It is emphasized that the lens is transparent in its normal development and that all congenital lens opacities are pure aberrations and not arrests.

WILLIAM A. MAW M.D.

Bakker, A.: The Action of the Sulfanilamide on Rabbit Lenses in Vitro. *Brij J. Ophth.*, 1947 31 216.

Some years ago the author demonstrated that the perfusion culture method of de Haan kept alive rabbit lenses in vitro for many days. He has now utilized this method for the study of the toxic action of chemicals on the lens.

A concentration of 20 mgm. per cent of sulfanilamide had no noxious effects on the lenses of a 7 weeks old rabbit, and after 3 days in the culture vessel the lenses were quite clear. When the concentration was raised to 400 mgm. per cent however the lenses of a 4 weeks old rabbit became quite opaque within 4 hours. Within 15 hours letters on an underlying paper could no longer be read. After 3 days the experiment was stopped. The opacities were chiefly in the posterior cortex although some were found in the anterior cortex. The lenses contained 385 mgm. per cent of sulfanilamide which shows that the capsule is freely permeable to this drug. The toxicity of the substance was much less marked when the lenses of adult rabbits were used and it required 5 days with a concentration of 400 mgm. per cent to produce some opacities.

The concentration of sulfanilamide required to produce the lens opacities is much above a normal therapeutic dose yet the author believes that some caution is advisable in use of the drug. A case is briefly mentioned in which a patient who had re-

these lesions are common. In the malignant phase, neuroretinal edema with a star-shaped figure in the macula flat detachment of the retina and other changes appear. Even here spontaneous remissions can occur. The course of the hypertensive arteri- oclerotic disease complex can be followed reasonably closely with the ophthalmoscope though the correlation is not an absolute one.

Diabetic vascular lesions of the retina. Diabetic retinitis is related much more closely to the duration of the diabetes than to its severity and the regulation of the blood sugar seems to have little effect on its onset and progress. It has been shown that there is an increased capillary fragility in patients with diabetic hemorrhagic retinitis and the author feels there is no doubt that the retinitis of diabetes is a manifestation of general capillary abnormality. He believes that the petechial hemorrhages are formed by small leaks in the capillary endothelium and it has been shown that the endothelium then goes out around the extravasated red cells to form an endothelial sac. Exudates may be caused by smaller leaks allowing only plasma to escape. The course of diabetic retinitis is generally progressive but there may be spontaneous remissions.

ROCKE H. JOHNSON, M.D.

Sugar H. S.: Acute Glaucoma; A Follow Up Study
Am J Ophth. 1947 30 451

In an analysis of 45 patients with a diagnosis of 'primary' acute glaucoma, studied over a period of 6 years it was found that 26.6 per cent showed some significant change during the follow up period. It is believed that clinical descriptions of the vascular reaction in the main diagnosis are not justified.

In this follow up study 3 of the 11 patients with spontaneous attacks of acute glaucoma had no externally visible ocular congestion. It is probable that the classical acute congestive glaucoma, chronic congestive glaucoma, dilatation glaucoma, and 'preglaucoma' are all clinical phases of the same condition.

Acute glaucoma may be superimposed on other forms, such as glaucoma capsulare and simple glaucoma.

Miotics used in treating glaucoma may add a congestive angle-narrowing factor when the angle is already anatomically too narrow. A combination with vasoconstrictors is suggested as a new approach to the therapy of acute glaucoma.

WILLIAM A. MAJOR, M.D.

Thomas, G. J., and McCaullin, M. F.: Pentothal Sodium in Ophthalmic Surgery *Arch. Ophth.* Chlc. 1947 37 451

The authors believe that intravenous anesthesia has a definite place in ophthalmic surgery because the period of induction is short and pleasant, and the depth of narcosis controllable and sufficient. It has the added ophthalmic advantages of a free operative field and of reducing the intraocular tension from 40 to 60 per cent. They believe pentothal sodium has

advantages over the other intravenous anesthetics since it causes less twitching and less postanesthetic nausea and vomiting.

The data is based on over 3 000 administrations of pentothal sodium for all types of ophthalmic surgery in patients varying in age from 7 to 93 years. The satisfactory results are attributed to careful preoperative, operative, and postoperative management. The authors note especially that a barbiturate should be given the night before surgery as a test of the patient's idiosyncrasy to the drug. Administration of atropine is emphasized since it tends to prevent coughing, sneezing or laryngospasm and they believe that cocaine hydrochloride used in the eye tends to prevent sneezing. The oropharyngeal airway is not used for fear of causing laryngospasm, but a tongue suture and a mouth hook are inserted instead. A 4 per cent solution of pentothal sodium is used for patients under 50 years of age and a 2 per cent solution for those of 50 years or older. Nifedipine is given to the older group and to those with coronary disease and arteriosclerosis. During the corneal section and cataract extraction the slow injection of a one half cubic centimeter of pentothal sodium is made with a 20 second pause following each injection. One cubic centimeter of pentothal sodium is given when the cataract is delivered. Occasionally coughing, laryngospasm, hiccup, cyanosis and cardiac embarrassment may occur. Since the most common postanesthetic complication is respiratory depression all patients should be given oxygen continuously until they have completely reacted. Those who fail to react within 2 or 3 hours after surgery have had an overdose of pentothal. In these cases the authors suggest the continuous use of oxygen, frequent aspiration, metrazol, hypertonic solutions of sucrose and repeated small transfusions of plasma. Pentothal sodium is contraindicated when there is interference with respiratory function in bronchiectasis, severe anemia, shock and in children under 8 years of age.

ROCKE H. JOHNSON, M.D.

EAR

Cawthorne Terence: Ménière's Disease *Ann Otol Rhinol* 1947 36 18.

The author discusses clinical details of Ménière's disease on the basis of his personal experiences during the investigation and treatment of more than 400 cases.

He mentions briefly the history of Ménière's original paper and the objections by some writers to the findings in Ménière's typical case. The author states that there is evidence in the literature that the disease has attacked many people who were more or less famous in history and there are even records that it may have affected people in the early days of the Christian era in Rome. More than 50 years ago it was suggested that the cause of the disease was an increase of pressure within the labyrinth and the condition was declared similar to glaucoma. Several other theories concerning the cause of the disease

were mentioned. The author shows several photomicrographs of normal labyrinths and of labyrinths affected by the disease, showing the pathology. Because of the definite pathology it could be stated that a firm basis for the disease was established and that the essential mechanism of the disorder is an obstructive distention of the endolymphatic system. Some men believe that a focus of sepsis may be responsible, although in the author's series of cases under review very few instances of probable foci of sepsis were encountered. The author believes that undue attention has been paid in the past to the influence of eustachian insufficiency and other conditions of the middle ear and even of the external ear upon Ménière's disease. He also does not believe that Dandy's view is correct.

Of the author's 434 cases under review slightly more than half were in males, and three-quarters occurred in patients between the ages of 30 and 60.

The general picture of the disease was highly characteristic and was exhibited by a large proportion of the cases under review although the signs and symptoms varied in their relative intensity and in order of their first appearance. In all cases there were for no apparent reason, periodic bouts of paroxysmal vertigo accompanied as a rule by nausea and vomiting, deafness of the perceptive type, always more noticeable on one side, and tinnitus but no other signs of disease within the central nervous system. A variable, but at times distressing feature of the complaint was the depressing influence of these sudden attacks upon the general well being and every day life of the patient. The nature, intensity, direction and duration of the attacks varied considerably not only from patient to patient but from attack to attack. The bouts tended to occur in groups, there being several within a relatively short period of time followed by long intervals of freedom which might extend over years. In some patients the attacks were always slight, while in others there was a combination of severe and mild attacks. The attacks did not appear to be precipitated by any particular activity but they often occurred in the early morning shortly after the patient arose. Occasionally they awoke a patient from his sleep. In less than half of the cases there was a warning of an impending attack. An increase in the intensity or an alteration in the character of the tinnitus was often noted prior to an attack, while in some cases there was an accentuation of the deafness or an increased dislike of loud sounds. A feeling of fullness, distention, or numbness just behind or in the affected ear was also noticed at times while a headache usually described in terms of pressure or bursting rather than of pain was sometimes experienced. The warning symptoms continued through the attack and at times lasted a short time afterward. In some cases there was a feeling of lightheadedness and slight disturbance of the balance before and after the attacks. The attack usually took the form of the sensation of movement of the surrounding objects less commonly of the subject himself and but rarely a combination of both. The

direction of the apparent movement could very seldom be described by the patient. The attacks might last a matter of minutes or a few hours, and, if severe, would often render the patient helpless. Some patients during an attack would be able to tell themselves home either by walking or occasionally by driving a car. Nausea and vomiting usually accompanied the attacks with varying severity. The vomiting appeared toward the end of the attack and all during the attack. Accompanying the attack were also pallor, cold sweat, a slow thrifty pulse, increased activity of the stomach and biliary passages, and at times even all points of the intestinal tract might be affected as by a strong vaginal spasm, and bowel movements would often make the attack even more distressful to the patient. The two symptoms of a cochlear disturbance, deafness and tinnitus, usually went together and they were rarely absent in the established disease. The deafness was of the perceptive type and presented two distinguishable features. In the first place the deafness was subject to sudden variations and an important feature of this type of deafness was the discomfort due to the distortion of loud sounds, particularly if they were high pitched. Some patients were made more uncomfortable by any sounds, particularly children's voices, the rattle of dishes, noisy planes, and road traffic. Because of this, the hearing on the affected side might be definitely handicapped to a greater extent than by the actual deafness that is present. The hearing commonly fluctuated with the deafness and it was not unusual to find two types of tinnitus in the same ear, such as a constant hum or buzz, and, often before or during an attack, a sound of jangling or chinery. True loss of consciousness during an attack was extremely rare and the author noticed it in only 5 of his cases. Nystagmus of the eyes accompanied severe attacks and often caused a temporary impairment of vision, although no true diplopia or loss of vision occurred without loss of consciousness. Spontaneous nystagmus was seen only during an attack and for a short while after an attack.

The author discusses the diagnosis of the disease and states that it rarely causes any doubt in established cases. The paroxysms of vertigo alternating with intervals of freedom, the perceptive deafness, particularly in one ear, the absence of any signs of disorder within the central nervous system, and the decrease in vestibular function on the involved side are usually characteristic and point toward the diagnosis. The disease must be differentiated from ear tumors, disseminated sclerosis, tumors of the eighth nerve, epilepsy and intracranial vascular disturbances. However the type of vertigo and other signs and symptoms usually help the differentiation.

The treatment of the disease, as also discussed, Once the diagnosis has been made, the first step is to tell the patient what he has, describing to him the pathology behind the disease and the prognosis. When this is done it usually relieves the patient of many worries concerning his condition. He then

know that most of the attacks can usually be controlled and sometimes abolished, although it does not necessarily mean the entire disappearance of all symptoms. In general conservative treatment tends to smother the attacks rather than to abolish them, while surgical intervention although it prevents further attacks may leave some residual dizziness particularly provoked by sudden head movements, and also a tendency to tire easily.

Many different forms of treatment have been advocated. The author refers to an article written previously by himself on this subject. In all of the cases under review he made a trial of conservative therapy. Most of them had had some treatment before particularly with sedatives which was of some help. He found that the exclusion of salt and salty foods from the diet combined with limitation of the fluid intake had resulted in a greater measure of relief than any other form of conservative therapy. The author gives a list of foods that should be avoided. These foods are those which commonly contain a large amount of salt. Added salt for seasoning should be avoided and bread should be baked free of salt when practical. No more than 2½ pints of fluid should be taken in any 24 hours. In addition injections of histamine have been successful in many cases.

Patients whose attacks were not controlled by conservative treatment, in whom only one vestibular labyrinth was affected and in whom the hearing on the same side was obviously impaired were considered suitable cases for destruction of the end-organ. This was usually effected by removing a piece of the membranous external semicircular canal, although it has been found that the same result followed tearing of the canal. Freedom from troublesome complications was attributed to the simplicity of the procedure although in 2 of 135 operative cases mild sepsis supervened. In 5 of 135 operative cases the sacculus endolymphaticus was incised, while labyrinthotomy such as alcohol injection membranous canal diathermy and membranous canal excision was done in 130 cases.

The author briefly describes the operation which is done under general anesthesia through a postauricular mastoid incision and the external semicircular canal exposed by the mastoid route. The incus is often removed to give better exposure. The membranous canal is identified after removal of the bony external semicircular canal. Part of the membranous canal is removed with fine forceps and the mastoid wound is closed without drainage. Of the author's 135 cases 133 healed by first intention and in 3 cases a low-grade infection with ear discharge followed in 2 weeks. There were no other complications and no deaths. As results of his operation in 135 cases the cochlear and vestibular function was abolished in 133 cases and not abolished in 2 cases. One hundred and twenty of the patients were benefited and were able to work, and 9 were not benefited and were unable to work, there is no record of 6 cases. The 2 cases in which both the cochlear and vestibular

function were not lost were cases in which a sacculus endolymphaticus was incised. One difficulty with the operation is that the procedure destroys any hearing in the affected ear but as a rule in the cases coming to operation the hearing is of no value. As a rule the patient's postoperative course is uneventful although there may be some considerable dizziness for a day or so but he is usually out of the hospital in about 3 weeks. He may have some dizziness on quick motion of the head afterward and he may also tire easily. However most patients are very gratified with the results and are glad to return to work within about 2 months after operation.

WILLIAM A. ARTHUR, M.D.

NOSE AND SINUSES

Wright, William K.; Shambaugh, George E., Jr.; and Green, Lois: Congenital Choanal Atresia. A New Surgical Approach. *Ann. Otol. Rhinol.* 1947 56 120

The authors state that atresia of the choana is a rare congenital condition and was first reported in 1839. Two hundred and thirty cases have been reported. The atresia occurs at the junction of the hard and soft palates and extends to the base of the sphenoid bone. About 90 per cent are bony in type and 10 per cent are membranous. A good percentage may be of a mixed type.

There is a low incidence of associated congenital anomalies with congenital choanal atresia. The authors mentioned several existing theories concerning the condition as follows:

- 1 Persistence of the upper part of the buccal membrane.
- 2 Persistence of the nasobuccal membrane.
- 3 Overgrowth of the palatine processes at the choanae so that they fuse not only with the septum but also with the base of the sphenoid bone.

These hypotheses are all difficult to prove or disprove, and the most popular conception seems to be the persistence of the nasobuccal membrane. The flaws in this theory were given.

The authors present a diagram of the embryological development of the choanae.

They report a case of a 23 year old white female who came to the Northwestern Otolaryngological Clinic, Chicago complaining of a mucopurulent discharge from her left nostril of 3 years duration. The patient was unable to blow her left nostril and had never been able to do so. Examination revealed no choana on the left side. A probe passed through the left anterior nares was prevented from passing into the nasopharynx by what appeared to be a bony obstruction in the posterior region. Mercurochrome, and later lipiodol, introduced into the left nostril did not reach the nasopharynx and x-ray films with lipiodol showed the presence of an atresia of the choana which was thicker below than above. The family history and past history were essentially negative. On closer examination it was noted that the lateral

nasal wall on the atretic side protruded medially at its posterior aspect and the floor of this nostril became elevated so that posteriorly it was 1 cm. above the floor of the other side. There was also a lateral deviation of the posterior part of the nasal septum toward the affected side and a medial displacement of the lateral wall of the nasopharynx on the obstructed side so that the left eustachian tube orifice lay almost in the midline. Lipiodol displacement showed absence of the left sphenoid bone with partial pneumatization of the left side by the right sphenoid. The left side of the nose contained typical glairy mucus. Nasal smears revealed many leucocytes but no *cosmophila*.

The authors briefly mentioned several procedures for the relief of this condition such as the use of chisels, gouges, curettes, cautery burrs, and electrocoagulation by either of two routes: splitting the soft and hard palates or by way of the anterior nares. The authors believed that a more adequate exposure than usual had to be done in this case because of the unusual medial displacement of the lateral wall of the nose and nasopharynx, including the sphenopalatine ganglion and the internal maxillary artery with its large branches. It was thought that a better exposure might be made by a Caldwell-Luc incision with removal of the anterior face of the antrum and by making a second window through the medial wall of the antrum at its posterior aspect. The advantage of this procedure would be that it provides a ready access to the sphenopalatine artery via the posterior wall of the antrum in case of unexpected and uncontrollable hemorrhage.

The patient was admitted to the Wesley Memorial Hospital of Chicago and the operation was performed after blocking of the second division of the trigeminal nerve via the posterior palatine canal. No other anesthesia was necessary. The usual Caldwell-Luc procedure was carried out and revealed a normal maxillary sinus. On removal of the lateral wall of the nose into the inferior meatus a thick, hard bony ledge was found projecting medially at a level with the posterior border of the antrum. When the posterior portion of the nasal septum was resected it was found that the thick bony ledge projected medially only slightly more than the lateral wall of the nasopharynx. It was decided that resection of this ledge might open into the sphenopalatine fossa and at best would produce a source of much granulation tissue. Therefore a large rubber tube was inserted through the anterior nares on the left and passed through the perforation in the posterior part of the septum into the nasopharynx. The Caldwell-Luc incision was closed in the usual manner and no other packing or dressing was applied.

The patient's postoperative course was uneventful. The rubber tube was removed after 48 hours and the patient was discharged from the hospital. She was followed up in the clinic and advised to sniff physiological sodium chloride solution into her nose. Epithelialization of the margin of the septal perforation was almost complete in a week and the opening of

the septum remained the same size (about 1.5 cm. 6 months postoperatively to date. The patient was able to breathe through both sides of her nose, although somewhat better on the right which was the normal side. However she could blow either side of her nose equally well and was very well satisfied with the operation. The mucoid discharge from the left side of the nose continued to be greater than from the normal side, but this has caused her little inconvenience as she was able to blow her nose adequately. The secretions however are slowly decreasing and may become unnoticeable in time.

The authors believe that this operation may be of value in other cases of this type in which there is unilateral choanal atresia. There is minimal scapulation and the absence of packs and other foreign material used postoperatively appeared to be responsible for the minimum infection and granulation seen during healing. In many cases described in the literature the postoperative packs, cautery incision of tubes over a long period of time and even epidermal skin grafts on the mucosal surfaces may all have been causing a greater tendency toward scarring and contraction of the new opening. This method gave better exposure to the operative field and better control of hemorrhage with less danger of injury to the pterygopalatine nerves and blood vessels.

WILLIAM A. ARMOUR, M.D.

Dunn, R. E.: Penicillin in the Treatment of Infections in the Nasal Passages and Sinuses. *Aust N Zealand J Surg* 1947 16 185.

The author used four methods in the administration of penicillin for infections of the nasal passages and sinuses.

Local application was adopted in the majority of cases as it offered a high concentration of the drug in the affected sinuses. The Proetz method of displacement was used twice daily supplemented by penicillin drops every 2 hours in concentrations of 250 to 2,500 units per cubic centimeter but 500 units were found to be quite adequate. Blocking of the nostrils by mucosal congestion and by meprobolol during operation prevented effective displacement. Nasal drops of 1 dram of penicillin were inserted in each nostril for 3 minutes every 2 to 4 hours with the patient in the Proetz position. Proof puncture of the antra and instillation of 3 to 4 c.c. of 500 to 5,000 units of penicillin was carried out once or twice a day for a period of from 5 to 10 days. Slow continuous irrigation of the antra with penicillin was carried out for 12 hours and repeated 12 hours later for a similar period.

Prolonged treatment with penicillin encouraged the growth of *Bacillus pyocyaneus*, which was combated by a dilute solution of mercuric iodine without reducing the activity of penicillin. The majority of patients obtained relief from symptoms and, on 12 patients examination showed improvement, although a greater proportion of these would have responded to ordinary conservative treatment, and only a small minority could conscientiously claim that their relief was primarily induced by penicillin. Patients with

secondary infection of the nasal passages following a common cold were benefited. Some patients developed a rash in the vicinity of the nasal vestibule which cleared after the cessation of penicillin.

Intramuscular injection carries the drug to the affected sinuses via the blood stream, but only in limited concentrations; hence one of the disadvantages of this method is that it necessitates large quantities of the drug being used to maintain only a relatively low concentration in the sinus area.

Combined local application of penicillin with oral administration of sulfamerazine was the third method of administration but the advantages of this method are not given.

The fourth method—simultaneous intramuscular injection and local application of penicillin—offered the maximum concentration of the drug in the area of the sinuses. Some patients with penicillin-susceptible organisms were not relieved while some patients with mixed susceptible and nonsusceptible bacterial cultures were relieved.

The treatment of allergic conditions and surgical removal of abnormalities causing stasis in the nasal passages and sinuses are important adjuncts to the penicillin treatment. A. B. VICARIO, M.D.

Robison J. Mathews: Pressure Treatment of Allergic Sinusitis. *Arch. Otolaryng.*, Chic., 1947 45 405.

In support of the therapeutic principles employed the author reviews the pathologic physiology and pathogenesis of allergic sinusitis.

In allergic disease there is an accumulation of fluid in the interstitial tissue spaces of the sinus mucosa. Stagnation of this tissue fluid is part of the pathogenesis of subacute and chronic allergic sinusitis and is responsible for intermittent attacks of infection and progressive degeneration of the mucosa. The factors controlling removal of this fluid from the tissues are arterial capillary filtration, venous capillary absorption, lymph flow and tissue pressure. The factor of tissue pressure is gauged by the resistance tissue offers to dilatation of its interstitial spaces by edema fluid. Acceleration of absorption of this stagnant fluid is accomplished by increasing tissue pressure artificially by means of a balloon filled with iodized oil.

The method consists first of making a small nasotomical opening beneath the inferior turbinate and then after 1 or 2 weeks, the introduction into the sinus of a No. 12 French self-retaining catheter which has had its self retaining head enclosed in a small distensible natural rubber balloon. A few days later the balloon is distended with iodized oil and pressure is maintained by the periodic addition of oil. These balloons may be left in place several weeks or months. By this method patients have been relieved of nasal stenosis due to increased turgescence of the turbinates, recurrence of nasal polyps, excessive secretion of the maxillary sinuses and the bronchopulmonary symptoms of bronchitis, cough and infectious asthma.

Six case histories, accompanied by roentgenograms, are presented. Difficulties encountered during the application of local pressure by the method described may be ascribed to temperament of the patient, the application of excessive pressure, infection and closure of the antrotomy opening, herniation of the balloon into the nose, nasal stenosis due to swelling of the turbinates and fibrosis of the mucosa.

The pressure treatment is most successful in subacute and chronic allergic sinusitis before extensive fibrosis of the mucosa has taken place. The use of the balloon should not be construed as a cure for all types of sinus infection and asthma as it will not return irreversible structural changes to normal. The relief of asthmatic symptoms in some cases indicates that the sinuses may be the source of some noxious substance which is an etiologic factor in asthma. The application of local pressure to the mucosa of the maxillary sinus should be considered as an adjunct to more conservative treatment of allergic sinusitis and not a substitute for any standard practice. JOHN R. LINDSAY, M.D.

Crowe S. J.: Irradiation of the Nasopharynx. *Ann. Otol. Rhinol.* 1946, 55 779.

The author presents as part of a symposium on irradiation therapy in otolaryngology and ophthalmology a summary of his now well recognized views on the effect of irradiation of the nasopharynx. He reviews his early experiences on the effect of irradiation of the nasopharyngeal lymphoid tissue and discusses indications, contraindications, application dosage and results. NOAH D. FARRINGTON, M.D.

MOUTH

May H.: Cleft Lip Repair According to Axhausen's Method. *Plast. Reconstr. Surg.* 1947 3 139.

The author first reviews the methods and procedures which have been proposed and used for closure of congenital cleft lips.

In the discussion he points out the faults of earlier techniques and also the development of better methods which have rewarded the efforts of men who recognized the shortcomings of cleft lip repair.

Credit for the stimulation of the interest in and accomplishment of more acceptable results is given to Veau, Blair and Brown, W. B. Davis, and Ivy and Curtis.

Forceful or early closure of cleft palate is not encouraged, and the author leans toward simple incisions rather than complicated geometric designs. The author believes that no advantage accrues to the concomitant closure of the hard palate and the lip as it increases the operating risk and does not simplify the later palate repair. Axhausen published a monograph in Germany during the war describing a method based on modern principles and aimed at simplifying incisions and utilizing adequate flaps.

As a result of personal experience with Axhausen's method in 36 cases, the author is enthusi-



Fig. 1

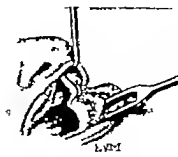


Fig. 2



Fig. 3

Fig. 1 (M y) Formation of the median turnover flap.
Fig. 2. Formation of the lateral turnover flap.

Fig. 3. Both turnover flaps are sutured together to form the floor of the nostril.

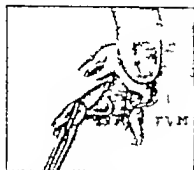


Fig. 4



Fig. 5

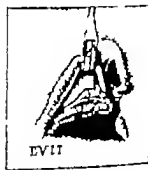


Fig. 6

Fig. 4. Formation of the alar flap and of the median vermillion border flap.

Fig. 5. The alar flap is sutured to the columella and to

the lateral turnover flap.

Fig. 6. Correction of septum displacement by rotation of the tissue median to the cleft.

astatic over his results and offers this article as an evaluation of the method and a recommendation to his confreres for further trial.

The technique for the most common deformity unilateral lip, alveolar process, and palate cleft, is given in detail, with illustrations. The operation is performed between the sixth and eighth weeks after birth if the child is gaining weight and is healthy and after a careful preoperative examination and evaluation of its condition. Axhausen recommends local anesthesia the author however prefers ether vapor. The operation is divided into 4 stages:

1. Formation of the floor of the nostril
2. Correction of the alar displacement
3. Correction of the septum displacement
4. Closure of the lip

The formation of the floor of the nostril is done by utilizing turnover flaps taken from the median and lateral walls of the cleft. (Fig. 1, 2)

The median flap incision extends from the nasal aspect of the columella to the lateroposterior aspect of the alveolar ridge, at the junction of the premaxilla and vomer. Mobilization must be done with extreme care by sharp dissection.

The lateral flap is developed by an incision which starts at the edge of the alveolar process and extends to a point where the alveolar process the tip of the

ala, and the vermillion border meet, and then up into the nostril. This incision must be made with care and precision. The cheek is mobilized from a lateral gingivobuccal sulcus incision. The median and lateral flaps are now sutured with cocaine chromic catgut.

The laterally displaced ala is mobilized, leaving a small flap developed around the tip of the ala. This flap is used to facilitate smooth approximation of the ala to the tuberculum of the columella (Fig. 4). The posterior edge of the flap is sutured to the median and lateral turnover flaps, and the anterior edge is sutured to the outer wound edge of the columella. The median vermillion border flap from the lip is developed at this time (Fig. 5).

Correction of the septum displacement is done by advancement of the mucous membrane along the median gingivobuccal sulcus. Through a sulcus incision the soft tissues are mobilized to expose the septum and the floor of the nose. The tissues are then advanced and sutured.

The formation of the lip is completed by the development of a lateral vermillion border flap of the same length as the median flap. The mucous membrane along the lateral gingivobuccal sulcus as well as the median side and the lateral and median lip sulcus are sutured. Suture is done in three layers: muscle, skin, and mucous membrane (Figs. 9, 10, and 11).

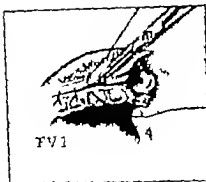


Fig. 7

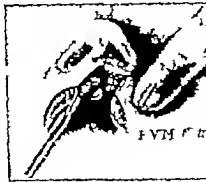


Fig. 8

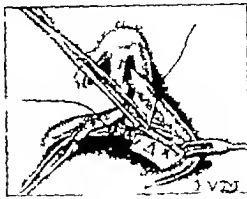


Fig. 9

Fig. 7. (May) Lateral advancement of the lip median to the cleft.

Fig. 8. Formation of the lateral vermilion border flap.

Fig. 9. Median advancement of the lip lateral to the cleft. (Figs. 1 to 9, inclusive, were redrawn from Axhausen, G. *Technik und Ergebnisse der Lippenplastik*. G. Thieme, Leipzig 1941.)



Fig. 10



Fig. 11

Fig. 10. Closure of the lip in layers. The muscle suture is tied posteriorly.

Fig. 11. To counteract notching of the vermilion border at the point of approximation, the vermilion border is

sutured at a different level than the skin. This is accomplished by reducing the vermilion border flap on the lateral side and by making the median vermilion border flap longer.

A nostril retention suture is used and the vermilion border flaps are lapped to prevent notching.

The author follows Axhausen's technique except for minor details. He states that Axhausen's method is based on firm closure of the cleft and correction of the deformities around the cleft, namely deviation of the nose, flattened nostril and shortness of the lip.

The method is said to be applicable to all types of lip clefts and secondary deformities.

FREDERICK W. MERRIFIELD, M.D. D.D.S.

Walker, D. Green: Severe Infections of the Mandible. *Proc. R. Soc. M., Lond.* 1947 40 309.

The author favors the treatment of acute infections of the mandible by systemic administration of penicillin without early surgical interference. Acute infections of the soft tissues around the mandible usually respond well to parenteral penicillin therapy but when abscess formation takes place incision should be made and dependent drainage established.

In local or diffuse chronic osteomyelitis of the mandible, treatment consists of the administration of penicillin and, in addition the timely surgical removal of remaining portions of teeth and sequestra.

Actinomycosis of the jaw responds to penicillin as well as to radiotherapy. Surgery in actinomycosis of the jaw is confined to the incision of abscesses and débridement of the mandible when it is involved. Further work is necessary to establish the optimum dosage for the treatment of infections of the mandible.

JOHN R. LINDSAY, M.D.

Berger: Solitary Central Giant Cell Tumor. *J. Oral Surg.* 1947 5 154.

The solitary giant cell tumor of the jaw bones probably arises in a central nidus. It destroys adjoining tissues and is not encapsulated. It may completely destroy the cortex of the bone and be covered only by mucoperiosteum. Giant cell tumors of the jaw bones are usually less aggressive than giant cell tumors of the long bones. They are not to be confused with surface epuli which are usually associated with some local trauma, are not locally invasive and cause only surface destruction of involved soft tissues and erosion of adjacent bone. It is difficult to differentiate the giant cell tumor from cysts or malignancies by x ray alone. The vacuolated appearance is not a pathognomonic sign.

Six detailed case histories are presented. Five of the lesions occurred in the mandible and 1 lesion occurred in the maxilla. The patients were from 10 to 40 years of age. Four of the 5 patients with mandibular lesions noted anesthesia or paresthesias of the lower lip over the area of distribution of the mental nerve. This symptom is considered to be pathognomonic or strongly suggestive of a neoplasm in differentiation from a cyst. Two patients were treated by surgical removal of the lesion which necessitated the removal of teeth. The defect had filled in with new bone and the patients were clinically well when last seen (5 and 12 years postoperatively). One of these had a history of two previous operations with recurrence. Four patients were given roentgen treatments of these 3 showed healing when last seen (3, 5 and 10 years postoperatively). The fourth patient had been treated too recently to evaluate the condition. X-ray therapy obviates the removal of teeth and bone and consequent mutilation and deformity. A biopsy was made in each case to establish the diagnosis.

JOHN R. LINDSAY, M.D.

PHARYNX

Godfredsen, E.: Malignant Nasopharyngeal Tumors Manifesting Themselves as Parotid Tumors. *Acta. Chir. scand.* 947:95, 1953

The author presents a report of 2 rare cases of malignant nasopharyngeal tumors which manifested themselves as parotid tumors. The condition was not diagnosed correctly at the time because of its polymorphic symptomatology—ophthalmoneurologic and otorhinological with metastatic glands in the neck.

The first case is that of a 36 year old woman who presented an indolent, steadily increasing node of 3 years duration at the angle of the right mandible and covering the lower portion of the right parotid area. Surgical removal revealed the tumor to be intimately adherent to the vessels. It was excised with difficulty. A slight facial paralysis occurred following the operation. Biopsy revealed a malignant endothelioma—a type of mixed salivary tumor. Six months after operation the tumor recurred associated with swelling of the posterior portion of the gingiva of the right lower jaw and shortly ruptured spontaneously. Pus was evacuated. The right facial nerve, masseter and abductor were paralyzed, and there was painful trigeminal neuralgia. A split, nodular fixed mass the size of an apple occupied the right parotid and retroauricular regions. There was no glandular tumor further down the neck. In the nasopharynx a lobate pink submucous tumor arose from the posterior wall and the right superior wall laterally. A roentgenogram of the base of the skull showed a large, osteous destruction on the right side, involving the foramen lacerum, rotundum, and ovale and the fifth and sixth cranial nerves. The microscopic picture was a cytodendrocytic atypical salivary gland tumor from the nasopharynx, with regional metas-

tases to the lymph glands of the right parotid gland. Roentgen therapy for a period of 67 days, during which 7,265 roentgens were administered, cured the primary tumor and the pains subsided but complete freedom from symptoms was not obtained. Ten years later the condition had progressed to a massive intracranial tumor, with right ophthalmoplegia, impaired vision, exophthalmos and choked disc. Death occurred in 4 years and 8 months after the diagnosis had been made.

The second case was that of a 48 year old man who presented a steadily increasing tumor of the right parotid gland, of 3 to 4 months' duration. Excision was made of a grayish soft mass the size of a walnut, which had extended deep into the submandibular fossa. The tumor was diagnosed as a reticulocell sarcoma. Three weeks later recurrence was ascertained. A diffuse firm, elastic, lobulated mass the size of half an orange was found to be deeply adherent to the neck. Rhinoscopically and roentgenologically a nasopharyngeal tumor could not be demonstrated. Following local roentgen treatment of the right parotid area, the tumor disappeared quickly. One year later a tumor appeared at the left parotid gland. It disappeared promptly on irradiation. Another year elapsed before a node was observed in the left supraclavicular region, which also disappeared following roentgen treatment. Rhinoscopy of the nasopharynx was negative, but roentgenograms revealed a swelling of the soft tissue of the roof. Fifteen months later the patient developed a right trigeminal neuralgia and paralysis of the masseter and oculomotor nerves, as well as nasal stenosis and hypoxemia. A flat submucous tumor in the roof and posterior wall of the nasopharynx appeared without swelling of the cervical glands. Unfortunately biopsy was omitted. A roentgenogram of the base of the skull showed no osseous destruction. Roentgen treatment of the nasopharynx for a period of 30 days (7,300 r) left the patient almost symptom-free but death occurred 4 months later (4½ years after the onset of symptoms), due to massive intracranial tumor invasion and distant metastases to the kidneys.

The article contains a brief review of the symptomatology and histopathology of both malignant nasopharyngeal and parotid tumors. In cases of parotid tumor the author emphasizes the importance of considering the possibility of metastases from a primary nasopharyngeal tumor as illustrated in the report of the cases presented.

A. B. PIERCE, M.D.

NECK

Bazzocchi, G.: Retrosternal and Intrathoracic Goiter (Sul gozzo retrosternale ed intratoracico). *Atti chir.* 946:35, 1954

Of 321 thyroids observed over a 15 year period and treated surgically, only 8 were retrosternal or intrathoracic. No case was exclusively endothoracic. The 8 patients were equally divided as to sex.

The subjective symptoms of goiter are as follows: stridor, attacks of nocturnal dyspnea, dysphonia, dysphagia secondary to compression of the esophagus, headache and a sensation of congestion of the head.

Inspection reveals a mass which is continuous from the cervical to the retrosternal region. Either a true edema or a cyanosis of the face especially of the lips, may be seen. Dilatation of the veins of the neck or upper thorax, and palpitation with retardation in the radial pulse may be present. Compression of the sympathetics produces unequal pupils. Percussion may reveal a retrosternal mass. Lesser symptoms such as paralysis of the phrenic nerve, hydrothorax or even chylothorax have been reported in the literature.

X rays reveal the mass or deviation of the trachea laterally and also may show displacement of the esophagus.

Laryngoscopic examination is useful in some cases, but a puncture biopsy rarely may be used for diagnosis.

In the differential diagnosis one must consider mediastinal and bronchopulmonary tumors, aneurysms (aortic, subclavian and innominate) and lastly, adenopathies.

Although substernal thyroids are rarely malignant they should not be treated lightly in older individuals.

Surgery is indicated in any cervical goiter that develops retrosternally although if symptoms are not severe the author advises conservative treatment for in females up to the age of 20 the condition may disappear spontaneously. Local anesthesia is the method of choice in most cases with a block from C₄ to C₆ bilaterally. Care must be taken in ligating the inferior thyroid vessel for it is carried down with the thyroid. The entire mass must be taken out or necrosis may result followed by hemorrhage which may predispose to infection of the mediastinum. A fragment of the capsule should be left in order to avoid opening of the pleura.

Complications which must be watched for are as follows: hemorrhage usually occurring after the sixth hour; paralysis of the vocal cords immediately following surgery (this occurs frequently but the

voice returns), and tetany (rare after 24 or 48 hours) which responds to treatment.

ARTHUR F. CIPOLLA, M.D.

Lundback, Knud: Investigations of Some Biochemical Changes Occurring during the Treatment of Hyperthyroidism. *Acta med. scand.* 1947 127 193

The author carefully studied the biological changes occurring during the treatment of hyperthyroidism with methylthiouracil. In addition 2 cases on iodine therapy were studied and compared. The study of each of these cases extended over periods of from 3 to 6 weeks.

Six cases were studied. One was restudied during thyroidin therapy for the myxedema that had been produced by overdosage of the methylthiouracil.

The conclusions can be summarized as follows:

1. No differences were demonstrable between the effects of methylthiouracil and iodine.

2. The decline in the minimum pulse rate was often completed before the decline in the basal metabolic rate.

3. Gain in body weight began immediately or after a latent period.

4. Serum cholesterol proved an extremely sensitive registrar of thyroid function.

5. Serum urea acid failed to exhibit uniform changes.

6. Frequently there was a brief transient increase in cell volume and serum protein probably reflecting an alteration in hemoconcentration during the fall in the basal metabolic rate.

7. The nitrogen content in the urine showed a tendency to fall during the period of observation.

8. The urinary excretion of creatinine remained within normal limits in all but 1 case.

9. The urinary excretion of calcium exhibited a decrease usually after a latent period of about 1 week.

10. The urinary excretion of sodium and chloride decreased in 1 case during the fall in the basal metabolic rate but remained unchanged in another.

11. No uniform changes were demonstrable in the urinary volume. Three patients exhibited a mild polyuria.

W. FOSTER MONTGOMERY, M.D.

SURGERY OF THE NERVOUS SYSTEM

BRAIN AND ITS COVERINGS CRANIAL NERVES

Schatzki, R., Baxter D. H., and Troland G. E.: Second Day Encephalography with Particular Reference to the Size of the Ventricles. *England J M* 947 236 4 9.

The authors report the results of encephalographic studies on 60 patients. Further roentgen study was made the day following the encephalography. The cases included patients who previously had had open head injuries, closed head injuries, convulsive states, and a variety of other conditions.

Measurements were made of the ventricular size on the day of encephalography and similar measurements were taken on the following day without the introduction of more air.

Of the 60 cases in which second-day measurements were made the ventricles were found to be larger on the second day in 23 cases (38%). A slight decrease in the size of the ventricles was found in 3 cases. In 22 cases there was no appreciable change and in 22 cases the amount of air in the ventricles was insufficient to measure. All the cases with pronounced secondary enlargement fell into the group with head injuries.

Porencephalic cysts have been identified in the second-day films when they were not visible in the original studies. In 8 cases a bulging of the inter-ventricular septum was noted on the second day.

The authors discussed the possible theories to account for the alteration in ventricular size. A satisfactory explanation is not available although the authors are inclined to believe that second-day enlargement may represent the true normal or resting size of the ventricle and that the first-day measurements may represent a temporary constriction resulting from the withdrawal of fluids and the sudden introduction of air. They further believe that marked enlargement of the ventricle on the second day is usually seen in association with previously damaged brains. For this reason it is suggested that second-day studies be carried out when one is investigating the possibility of brain injury resulting from a former trauma.

HOWARD A. BROWN, M.D.

Abbott K. H. Penicillin in Treatment of Cranio-cerebral Injuries of War. *Surgery* 947 33.

The author describes his experience with the use of large doses of penicillin in the treatment of cranio-cerebral injuries with particular reference to the local application of penicillin in the ventricles and brain as well as the use of large doses in the subarachnoid system in patients with meningitis.

In a series of more than 200 cases of cranial injury in the southwest Pacific theatre of operations, 63 patients with severe compound cranial cerebral injuries received penicillin in the intracranial wounds. It is

stated that no untoward reaction was observed in this series of cases and dosages on the order of 50,000 units of penicillin were introduced into the ventricles. Penicillin in the amount of 100,000 units was introduced into the cisterna magna in a case of pneumococcal meningitis.

In a footnote attention is called to the more recent reports on the toxic effects of penicillin in the nervous system, which appeared after the present paper was submitted for publication. The author believes that perhaps impurities in penicillin might account for some of the reactions reported by other workers but he discarded this theory in view of the more detailed work by investigators in this country. He concluded that it would seem preferable to continue penicillin therapy with smaller doses, and gradually increase the concentration when it is being used in direct application to the central nervous system.

HOWARD A. BROWN, M.D.

Ecker, Arthur D.: Pedicled Pericranial Grafts for the Repair of Dural Tears in the Temporal Fossa of the Skull. *Arch. Otol. Clin. Res.* 377.

Pointing out the necessity of excluding the contents of the outside world from the intracranial space in the event of severe basilar fractures of the skull and cerebrospinal rhinorrhea, and with the fact that the fluid must be contained within its normal confines, the author presents a method of repair of the dural defect, such as seen over the cribiform plate using a hinged pedicle flap of pericranium.

After a bifrontal scalp flap has been raised and removing the pericranium along with the tissue of the inner layer or pericranium, a strip of the second apron of tissue. A right-angled incision extending across the midline is then cut and bent outward to the right, hinged on to the pericranial muscle. The defect is then explored and any débridement of the brain which is necessary is done. The dura and contents are evacuated from the site of injury. The apron of pericranium is brought backward across the craniotomy and laid upon the midportion of the anterior cranial fossa so as to extend well beyond the dural defect and the dura is then sutured back into place. The weight of the apron will hold the dura in close apposition to the bone lying between it and the bone, so that it is not necessary to hold the graft in place. The apron is then wired into position so that it does not pass the graft which has, at this point, been passed between the edge of the flap and the orbital bone.

Several case histories are reported to show the effectiveness of the operation.

Anderson Frank, M.: Subdural Empyema Secondary to Frontal Sinusitis. Review of Clinical Features and Report of 3 Cases. *Ann. Otol Rhinol.* 1947 56 5

The author believes that subdural empyema is a common intracranial complication of frontal sinusitis, occurring most often over the cerebrum but rarely over the cerebellum; it is frequently overlooked in the clinical diagnosis with death as the result of mistaken or neglected diagnosis. The condition may likewise follow infection within the other paranasal sinuses or the middle ear. The mode of entry of the organisms is usually by way of thrombosed dural veins. The layer of pus, which may be widespread, is actually protected from direct contact with the brain by the arachnoid unless a breakthrough occurs, as may indeed happen. The author states that subdural empyema should be suspected when, in the presence of frontal sinusitis there is "orbital swelling, persistent headache, malaise, fever at times, with chills, meningeal signs and lethargy." The appearance of focal or generalized convulsions, hemiparesis, aphasia, and deviation of the eyes assure the diagnosis and indicate that surgical drainage is imperative.

Subdural empyema may exist together with extradural abscess formation. The differential diagnosis rests between intracerebral abscess, longitudinal sinus thrombosis, or purulent meningitis. The treatment is surgical drainage with supporting chemotherapy.

Three case reports are given in some detail to illustrate the difficulties of diagnosis and results of proper surgical care. JOHN MARTIN, M.D.

Kristoff F. V., and Odom, G. L.: Ruptured Intervertebral Disc in the Cervical Region; A Report of 20 Cases. *Arch. Surg.* 1947 54 187

The authors present 20 cases of ruptured intervertebral disc in the cervical region, 16 of which were cases with uncomplicated nerve root compression and the 4 others were cases of pressure on both the cord and root combined. The authors stressed that the high percentage of cases with root compression alone as compared to those noted in previous reports suggests an earlier recognition of the correct diagnosis. The pathogenesis may be divided into (1) the period of root compression, (2) the period of unilateral cord compression with or without marked root compression and (3) the period of bilateral cord compression with marked unilateral or bilateral root compression.

During the period of uncomplicated compression of the root the subjective complaints are usually pain in the lower neck that soon is followed by pain radiating from the neck down to the shoulder and arm accompanied by paresthesias in the more distal area. Both pain and paresthesias are aggravated by movements of the head and neck which result in direct compression of the nerve root. Objective signs are either those of mechanical defense or neuropathologic signs. The former act to protect against com-

pression of the nerve root. These are tilted head, wry neck, tenderness to manipulation of the lower cervical spinous processes and most reliable of all tenderness to hypertension and lateral flexion of the head toward the side of the pain. These movements tend to reproduce pain and paresthesias. Neuropathologic signs consist of selective hypotonia, weakness, and in late phases, fibrillation and atrophy of certain arm muscles, dissociated sensory impairment in special dermatomes and last, diminution of certain reflexes. The latter are indicative of degeneration of the nerves involved.

Diagnosis of a ruptured disc at the fifth cervical interspace may be made when pain and paresthesias are referred to the radial side of the arm, thumb and index finger. Sensory impairment may or may not occur in the same distribution. Weakness is found in the deltoid and biceps muscles with loss of biceps reflex. A ruptured disc at the sixth cervical interspace can be diagnosed when pain and paresthesias are referred to the extensor side of the arm, dorsum of the hand and one or all of the 3 middle fingers. Sensory impairment occurs in the same area. Weakness appears in the triceps muscle and the triceps reflex is diminished. Listed and described in the differential diagnosis of a ruptured cervical disc with uncomplicated root compression are: cervical arthritis, the scalenus anticus syndrome, laminar cervical fractures, cervical rib, subdeltoid bursitis, brachial neuritis, Pancoast's tumor and cervical radiculitis. The use of oblique x-ray views of the neck and cervical myelography are discussed as part of the diagnostic armamentarium.

If root involvement goes on to unilateral cord compression the root signs will be masked by the cord signs, which are ipsilateral pyramidal tract signs, and contralateral spinothalamic involvement with an indefinite sensory level several segments below the actual lesion. The root signs such as weakness of the muscles, fibrillation, and diminution of the tendon reflexes of the arm will be attributed to a lesion in the anterior horn. No differentiation can now be made between a herniated disc and a spinal cord tumor. It may be that an unrecognized lesion with unilateral cord compression may go to complete bilateral cord compression because of further protrusion of the disc. Root signs may no longer be recognizable. The differential diagnosis may have to include syringomyelia, intramedullary tumor and even occasionally subacute combined degeneration of the spinal cord. However the final diagnosis may not be made until the lesion is exposed. Note was made that manometric studies and total protein estimations did not seem to aid much in evaluating the level of the lesion.

Operation is performed with the patient in a sitting position under tribromoethanol and intratracheal ether. The routine method of exposure is carried out. The herniated disc is removed with forceps and no attempt is made to curet the interspace.

As an addendum the authors mention 18 other patients who had been operated upon; 1 of these had

combined root and cord compression while the others had uncomplicated root compression.

RICHARD C. SCHNEIDER, M.D.

Golnard, P., Descara, P., and Garré, H.: Traumatic Meningitis and Ventriculitis (Ménigites et ventriculites traumatiques) *J. chir. Par.* 1947 63 7

Traumatic meningitis, formerly considered absolutely fatal, is now amenable to cure by chemotherapy. The criterion of cure is a negative cerebrospinal fluid for at least 3 days. Although usually following war wounds or fractures, traumatic meningitis may also follow skull injury without fracture. Besides the usual organisms encountered, the authors found a case due to Pfeiffer's bacillus. In the presence of multiple wounds, care is urged in the evaluation of scalp and spinal wounds. The dangers of incomplete preoperative shaving and of using muscle from suspect areas for hemostasis are stressed also the danger of finger contamination of the wound by disoriented patients. Meningeal infection may also be favored by juxtadural hematomas, serous meningitis, and concomitant shock, as well as an intracranial aspirative vacuum.

Meningitis following basal fracture is rare but usually more serious and may under certain circumstances present a condition similar to perforation peritonitis. Escape of cerebrospinal fluid via the natural cavities may afford temporarily adequate drainage but once blocked there remains only a dangerous port of entry.

Ventriculitis, although rare, may result from direct contamination by a missile from ventricular fistula of surgical origin, or from imperfect closure of the dura mater or hairy scalp. Infection following fistulization increases the cerebrospinal fluid pressure and leads to rupture of sutures; this enlarges the fistula and creates a vicious circle.

Following a discussion of the pathology and clinical picture of the various types of meningitis and ventriculitis, the authors mention newer forms of meningitis caused by bacteriostatic therapy. Among these there is a prolonged but nevertheless fatal type, a type with late onset and prolonged attenuated course, and an aseptic puriform meningitis due to repeated subarachnoid injections of penicillin. In the prolonged fatal meningitis, temporary improvement following treatment is followed by recurrence again and again with progressive deterioration until finally autopsy reveals a diffuse purulent involvement. Repeated inadequate doses of penicillin change the morphology of the organisms, streptococci or staphylococci taking on the appearance of pneumococci.

Inadequate treatment may leave an aseptic puriform meningitis easily cured. In cases of meningeal reaction to penicillin the cerebrospinal fluid is transformed into a thick, whitish purée which will not pass through the puncture needle. It retrogresses only after cessation of the penicillin therapy.

Ventriculitis due to perforation, with ventricular inundation from rupture of a contiguous abscess and

which was formerly fatal within a few hours, responds to prompt incision and evacuation of the ventricle followed by saline irrigation and intraventricular injection of penicillin.

Subacute fatal ventriculitis is a creature of bacteriostatic therapy. Because of the penicillin, the cerebrospinal fluid may remain almost clear after the organism has been demonstrated. Recissions and exacerbations follow to a stage of severe diffuse rigidity and fatal termination. There is a type of regressive suppurative ventriculitis and a condition of one ventricle containing a pusy exudate. The authors noted response of intracranial pressure and confusional symptoms to withdrawal of the residue in 1 case.

Except in delayed meningitis, spinal puncture should be delayed until the fifth day following injury exploration via the trephine being less dangerous. In late meningitis, care is needed to exclude tuberculous meningitis. Ventricular puncture in meningitis of the convexity compensates therapeutically for its potential dangers, if made under the cover of intraventricular injection of penicillin. Ventriculography in abscess is justifiable only when indispensable for localization. After abscess evacuation it should be used if there is any doubt of rupture, asepsis, and it is immediately imperative as the least suspicion of ventricular inundation. Ventriculography is indicated in late ventriculitis in the case of involution and occasionally for ventricular fistula. Harmful though temporary hypertension can be considered. Intraventricular injection of penicillin will break the vicious circle caused by the fistula.

Improvement in statistics are also due in part to advances in neurosurgical technique. Drainage of cranial wounds is now superficial except for the local introduction of penicillin. Imperable also comes with autografts, if necessary is imperative.

Meningitis may develop in spite of preventive chemotherapy. The authors use sulfonamides and penicillin, both systemically and locally for prophylaxis. They make a paste of penicillin solution and sulfonamide. In basal fractures, nasal instillation of penicillin powder has been recommended. For curative treatment sulfonamides and penicillin are given parenterally and penicillin, or if preferable, sulfonamide by the subarachnoid route. Cures have followed the intramuscular administration of penicillin in cases of meningitis developing in spite of sulfonamide therapy. The subarachnoid route was superior. The ventricular route is recommended chiefly for hyperacute cases. The suboccipital route may be cautiously be preferable to the spinal, since repeated punctures are better tolerated. Intrathecal injections combined with systemic administration yields the greatest certainty of cure.

As regards dosage the intramuscular dose is from 100 to 200,000 units daily and the subarachnoid dose not more than from 20,000 to 30,000 units daily in a dose. Larger doses over too long a period may cause aseptic puriform meningitis. To avoid irritation of the subarachnoid space, a solution of

SURGERY OF THE NERVOUS SYSTEM

to 1,000 units of penicillin per cubic centimeter should be diluted with serum to 1,000 units per cubic centimeter especially for cases of ventriculitis. Some cases of meningitis have responded to much smaller doses, but, when possible it is much better to give a large initial dose and repeat it regularly for 6 or 7 days. Subarachnoid injections which are better tolerated. Associated surgery may be required to prevent relapses. Surgery is usually required for a fissure in the basal region connecting a septic cavity with the nasal fossa or petrosa. This must be occluded with a piece of fascia lata.

In ventriculitis due to inundation following rupture of an abscess an emergency operation is indicated. Evacuation of the abscess must be supplemented by ventricular puncture lavage of the ventricle with serum and injection into the cavity of the ventricle with serum and injection into the cavity of the ventricle with serum and injection into the cavity of the ventricle with serum. For the first few days, only the ventricle on the side of the abscess is treated. Then after several days, when the infected ventricle has been rendered aseptic, the treatment is directed to the other ventricle. At the same time penicillin is administered parenterally and same time penicillin is administered parenterally and same time penicillin is administered parenterally. In less than a week the cerebrospinal fluid will be aseptic. The treatment of ventriculitis with ventricular fistula is more tedious, including closure of the fistula with a graft of dura mater and meticulous autoplasty of the hairy scalp. Intensive treatment of the concomitant meningitis is accomplished with subarachnoid injections of penicillin. Stricker reports cure of 1 case by this method.

EDITH SCHANZKE MOORE

SPINAL CORD AND ITS COVERINGS

Inman, Verne T., and Saunders, J. B. deC. M.: Anatomoclinical Aspects of Injuries to the Intervertebral Disc. *J Bone Surg.* 1947 29 461

The authors who are orthopedic surgeons, recognize two factors in the problem of the pathology of the injured intervertebral disc first, that of deranged spinal mechanics and second the effects of spinal nerve irritation and compression. They point out the physiological importance of the high water content of the nucleus pulposus and the tension under which it normally exists. The resiliency of the spine, however, and the motions permitted to it are not due to any elastic turgor of the nucleus, but rather to the elasticity of the ligamentous structures. The deep, aching pain seated within the low back area, at the level of the pathological disc, is due to ligamentous strain and irritation of the ligamentous structures being among the more sensitive tissues of the body. Obviously the segmental pain is due to the pressure of the herniating mass upon the nerve root or roots. A rather novel interpretation of pain of the "fast and slow types is given.

The authors would divide patients with injury of the intervertebral disc into three categories. First patients with deep pain in the back and with pain

extending into one or both lower extremities due to local ligamentous irritation and strain are properly treated by immobilization and support. Second there are patients with local backache due to ligamentous strain and vertebral instability who also have segmental pain due to compression of a root. In this group mere removal of the herniated disc alone will not give the patient complete relief by curing the compression only since unless the painful ligamentous structures are protected the backache will persist. Third there is a minority of all patients who have little or no backache but who present signs of neurological changes of a segmental nature and removal of the herniating mass and decompression of the nerve root will give good relief if surgical intervention is sufficiently prompt. An interesting and lengthy discussion of the paper as read is appended.

JOHN MARTIN M.D.

PERIPHERAL NERVES

Potter, S. E., and Croce, E. J.: The Treatment of Peripheral Nerve Injuries Complicated by Skin and Soft Tissue Defects. *Ann. Surg.* 1947 125 349.

Because the authors believe that at times proper early repair of an injured peripheral nerve may be sacrificed in order to obtain a good cosmetic result in an extensive wound through plastic surgery or vice versa they present the thesis that it is altogether surgically sound and technically possible in many patients to perform the plastic and neurosurgical procedure at the same operation. Some alteration in the incision for the nerve repair may have to be made from the standard approach, but in 7 patients treated by the combined operation, good exposures were obtained, standard methods of nerve repair were carried out, and defects in the soft tissues were closed with good tissue, assured of viability with the use of pedicle grafts.

The authors do not favor the use of free grafts for the closure of defects in a wound containing a sutured nerve, believing that such grafts may (as when used in other types of defects) become ischemic and deter the results of the nerve repair. For the repair of defects of the upper extremity they use the anterior abdominal wall for the source of the pedicle flap for the repair of defects of the lower extremity they use the opposite extremity. The standard methods of plaster fixation while the graft is still on the pedicle, and pressure dressings are used. The donor site is treated by the application of sliding skin grafts. Local anesthesia is used.

JOHN MARTIN M.D.

Davis, L., and Perret, G.: Methods of Nerve Repair *Surg. Clin. N. America* 1947 27 117

It is the belief of the authors that as a general principle, the earlier a nerve can be sutured after injury the better are the chances for effective regeneration of that nerve. They believe that primary suture in a fresh wound should always be done and

that, even in a wound suspected of being contaminated, the nerve should be sutured if such a procedure can be carried out without additional trauma or undue tension at the suture line. They suggest the local and systemic use of antibiotic drugs in such instances.

In cases of large and obviously contaminated wounds in which there is gross destruction of the nerve over a distance it is best to fix the nerve ends by a stay suture in order to prevent retraction and loss of identification in the dense scar that will have to be dissected when the eventual nerve repair is done weeks or months later.

The various methods of nerve repair are mobilization of the nerve, relaxation of the nerve, transposition, primary end-to-end approximation of the nerve fragments, stretching with secondary end-to-end suture, transplantation of nerve grafts, and nerve to nerve anastomosis; all these are to be used alone or in combination, whichever method the case may require.

The authors have had extensive experimental and clinical experience with nerve grafting and while they recognize the superiority of autogenous grafts when grafts are necessary they point out that such grafts are seldom obtainable and that the use of fresh homogenous grafts may serve as second choice, with good results in some cases. Simple end-to-end suture approximation is the method of choice when it can be done.

The technicalities of the usual silk suture technique is discussed, as well as the newer method of plasma clot suture. The use of an impermeable protective layer of any material about the suture line is discouraged by these authors; they point out that the vascularizing effect of the surrounding tissues of the nerve bed is necessary for proper nutrition of the suture line or of the inlaying graft. The senior author's interest in the follow-up care of peripheral

nerve injuries, particularly as it concerns physical therapy is re-emphasized. JOHN MANN, M.D.

SYMPATHETIC NERVES

Threadgill, F. D.: Afferent Conduction in the Sympathetic Ganglia Innervating the Extremities. *Surgery* 1947 21: 569.

The author was induced to reconsider the old and argued subject of afferent conduction within the autonomic nervous system by the fact that under some such conduction pathways the relief of some various disease states by appropriate sympathectomy cannot be explained. In specially prepared animals (the experiments being illustrated by excellent diagrams) he has shown the effect of painful stimuli, such as heat applied to a foot, or arterial injection of lactic acid distal to the point of blockage, or anatomical removal of the sympathetic reticulating that extremity. He concluded that sympathetic afferents from the extremities are similar in function to the viscerosensory fibers in the spinal trunks, and that the relief of pain brought about by sympathectomy in the various painful disease states may be due to the relief of vasospasm or the blockage of afferent impulses from the vessels and placental coenos apparatus of the extremities, or both. He believes that it is possible that afferent impulses arising from the involuntary structures may pass primarily to the corresponding sympathetic ganglia for "integration" with the sympathetic efferents before they enter the spinal cord.

Early in the pain state, sympathectomy will be effective if there is no change in the spinal nerve, but later in the fixed canalopic state, for instance, sympathectomy will be less effective because of permanent changes in the spinal nerve. The nature of these changes is not discussed.

JOHN MANN, M.D.

SURGERY OF THE THORAX

CHEST WALL AND BREAST

Corey M. E., MacVine, J. S. and Bigby M. A. M.:
The Treatment of Breast Abscesses with Penicillin. *Brit. M. J.*, 1946 2 845

Methods of treating breast abscesses were studied. Alternate patients were treated in the conventional manner and used as controls. No case was accepted for this investigation unless a well defined tender and indurated mass was palpable in the breast tissue. The infecting organism was the *Staphylococcus aureus* in the great majority of the cases. Secondary infection with the *Streptococcus hemolyticus* occurred in 3 of the controls. The other secondary invaders were the *Staphylococcus albus*, *Micrococcus tetragenus*, and *Bacteria coli* and proteus occurring equally in the controls and penicillin group. Suppuration seems to have been prevented by the sulfonamides, but once pus formed in an abscess it continued until healing was well advanced. None of the penicillin treated patients avoided pus formation. Suppuration seemed to be speeded, localized quickly and disappeared quickly. In the control group there were 22 operations performed on 17 of the 18 patients. In the penicillin treated series there were 4 operations. Complications in the same or group consisted of secondary abscesses in the same or opposite breast or in the axillary glands in 6 cases, septic dermatitis in 3 cases, and hepatitis in 1 case. In the penicillin group 2 secondary abscesses developed following local therapy only and a milk sinus persisted in a third case and prolonged the healing time.

The healing time was estimated from the beginning of the treatment until no further dressing or local therapy was required. Comparison showed that in the penicillin treated group the average healing time was one-half of that of the controls, and that in only 1 case of the former group did the healing time exceed the average time of the controls. Breast feeding had to be stopped in the majority of the controls. In the penicillin treated group the mothers continued to nurse their babies on the normal breast throughout the treatment and resumed feedings on the other breast after healing took place. Hospitalization time of the penicillin treated group was also half that of the controls.

Penicillin (15,000 units every 3 hours) was administered by intramuscular injection in the acute inflamed stage and was stopped as soon as pain diminished the flush faded, edema lessened, and fever subsided. As soon as fluctuation could be detected, aspiration of the abscess under local analgesia was done. Penicillin was given intramuscularly prior to this procedure and was injected into the abscess cavity in volume equal to two-thirds of the volume of pus aspirated. If doubt existed as to the complete localization and it was possible to inject a full 24

hour dose without leakage, 120,000 units of penicillin in the appropriate volume were injected otherwise a solution containing 500 units per cubic centimeter was used. If no sinus formed this procedure was carried out every day until the appearance of sero-sanguineous exudate free of the *Staphylococcus aureus* on smear and culture, at which time treatment was stopped.

Instillations of penicillin were often made through a sinus that formed where the abscess pointed. Pus was expressed from the cavity and the penicillin was instilled by means of a fine rubber tube or needle. The opening was closed by a cotton-iodine dress. The opening in the penicillin. Large cavities containing to seal in the penicillin. Large cavities containing from 100 to 150 c.c. were incised and evacuated. The closure being made around a 5 mm. tube. The tube was used for aspiration of the pus and the instillation of the penicillin. Large cavities were treated twice daily.

Two great advantages of local therapy are the feasibility of introducing relatively large concentrations of penicillin at the focus of the infection and the insurance of drainage and irrigation of damaged surfaces with a minimum of trauma and an increase in the rate of healing.

EDWARD W. PASSARELLI, M.D.

TRACHEA, LUNGS, AND PLEURA

Waldapfel, Richard: Classic and Other Types of Tracheotomy. *Arch. Otol.* Chlc., 1947 45 446

The author discusses the various types of tracheotomy the postoperative care of the patient, and the complications which may arise. Two types of the operation, namely, the emergency and the regular tracheotomy, are described in some detail. The latter is illustrated step by step. The 2 fundamental principles for successful tracheotomy are (1) the cricoid cartilage should never be injured (the trachea is opened a way from the cricoid cartilage, at least as far as the second ring) and (2) provision for the cannula should be made by excision without distorting the tracheal rings. The author employs a specially designed instrument for this purpose. The cannula is held in place by a tape which is threaded through the 2 eyes of the shield of the cannula and tied at the back of the neck of the patient. In the United States the Jackson type of cannula is employed. The most frequently encountered complications are hemorrhage, emphysema, and disturbances in swallowing.

The cannula is removed as soon as the patient is able to breathe both day and night, with the cannula blocked.

Patients requiring permanent use of the cannula as in chronic stenosis, should be taught how to change the cannula before they are discharged from the hospital.

ROBERT TURNELL, M.D.

INTERNATIONAL ABSTRACTS OF SURGERY

Moerach, H. J., and Gaget, O. T.: Pulmonary Cysts. *J Thorac S* 1947 16 179.

Pulmonary cysts are of special interest because of the variability in the clinical symptoms that they may produce and the difficulty that may be experienced in their differential diagnosis. They may be divided into two main types, those arising from the bronchial mucosa and those that are alveolar in origin. There may be various gradations between these two types. The causation of pulmonary cysts is not definitely established. While many cysts are congenital, clinical evidence would seem to indicate that many are acquired. A study of cystic bronchiectasis illustrates the rapidity with which cystic dilatation of the bronchi can take place.

Pulmonary cysts with a bronchial communication are more likely to give rise to clinical symptoms than those in which such a communication does not exist although the latter may give rise to clinical symptoms primarily because of pressure on the neighboring bronchi and subsequent bronchial infection. Cough, expectoration, hemoptysis, thoracic pain, and attacks of fever are the chief symptoms found associated with pulmonary cysts.

Two cases that would indicate that carcinoma may develop within a pulmonary cyst are presented. The best treatment of pulmonary cyst is surgical removal.

Fried B M: Bronchiogenic Adenomas; Benign Tumor of the Bronchus. *Arch Int M* 1947 79 20

Adenomas constitute from 6 to 12 per cent of all bronchial tumors and are the most common benign bronchial neoplasms. They tend to affect the larger bronchi (accessible to the bronchoscope) are more common in the lower than upper lobes are more common in the right lung (58.5%) than in the left and are found more frequently in women (55.7%) than in men. The maximum incidence occurs in the decade from 30 to 40. The author considers bronchial adenomas to be benign tumors, although they metastasize extremely rarely and then after many years.

Adenomas arise either from (1) the bronchial mucous glands or (2) the basal cells of the bronchial mucosa membrane. While characteristically encapsulated, they frequently grow both toward the bronchial lumen and through the bronchial wall toward the lung to produce an "iceberg" or collar button contour a point of importance in the attempt at bronchoscopic removal. When they are confined to the lumen, radium, forceps or electrocoagulation alone may effect a cure. Lobectomy or pneumonectomy is necessary for larger tumors or when there is putrid infection secondary to bronchial obstruction. Early complaints with adenoma are (1) cough productive of mucoid sputum occasionally tinged with blood, (2) respiratory wheeze and (3) abrupt and abundant hemorrhage. Carcinoma while producing hemorrhage rarely causes the profuse hemorrhage of adenoma.

Six cases are reported illustrating various policies arising with bronchial adenoma. In 1 (one) with a lined capsule was believed to have totally excised the blood supply with resultant loss of viability of all the tumor cells—an unusual and curious result. FRANK B (CHIC, N.Y.)

Sano, M. E., and Almeida, R., Jr.: Five Types of Called Adenomas; A Histopathologic Study. *Arch Pathol Chlc*, 1947 43 135

Five cases of bronchial adenoma are reported by the authors with pathologic descriptions. Case 1 illustrates the inadequacy of the local removal of pedunculated bronchial adenoma. This case is shown the intimate relationship of the bronchi.

The presence of bone in the serous glands, however, it is considered insufficient evidence to support the hypothesis that such tumors originate from the developed bronchial buds.

All these tumors are considered to be "mixed" the two component cells being of epithelial origin. The tumors described were found to have weak tendencies and were considered potentially malignant. In 1 cancerous alteration had occurred only for this reason, radical surgical removal is indicated when feasible.

Oncocytes were found in 3 of these cases, but none were they found so profusely as in the case of bronchiectasis, in which no adenoma is located. These cells do not resemble tumor cells.

Jones J G.: Bronchiogenic Carcinoma. *J A M A* 1947 134 3

Bronchiogenic carcinoma accounts for 10 per cent of all cancer in men and about 2.5 per cent of all cancer in women. Reliable statistics indicate that the disease is increasing. Symptoms are nonspecific and degree of obstruction of the bronchi. Cough is the earliest symptom (80%) and discomfort or pain the second most common. Hemoptysis occurs in about one-half of the patients. Roentgenography is the greatest single aid in diagnosis. Bronchoscopy is next most important and will permit biopsy in from 60 to 75 per cent of the cases. The important aid in cases which cannot be biopsied. Needle biopsy is disapproved because of the danger of hemorrhage, infection, and tumor extension along the needle track.

Exploratory thoracotomy with a view of proceeding with pneumonectomy in cases not proved by biopsy is considered entirely safe. The incidence of recurrence following lobectomy makes total pneumonectomy with resection of the regional mediastinal choice. Irradiation only palliates. Preparation for pneumonectomy is essentially the same as that required for other major surgical procedures.

Among 196 carcinomas of the lung seen over the past 4 year period, only 39 per cent (78) were clinically operable. Only 39 per cent of the 66 patients who accepted operation were found to have resectable tumors on exploration (50% of the 196). The operative mortality was less than 4 per cent. Eleven, or 39.5 per cent of the 37 patients who were operated upon and left the hospital are dead of various causes including recurrence and metastases. Survival statistics cannot yet be evaluated for this group.

FRANK B. QUEEN, M.D.

Dorner, B. A. and Wiles, J.: The Intrabronchial Administration of Penicillin and Sulfonamide. *Clin. Proc. Cape Town*, 1947 6: 10.

There are three general indications for intrabronchial therapy of bronchiectasis:

- 1 Cases with a minor degree of bronchial dilatation and symptoms not severe enough to warrant lobectomy
- 2 Cases in which the extent of the disease or the general condition contraindicate lobectomy or those in which the patient refuses operation
- 3 Cases in which it is desirable to sterilize the bronchi and improve the general health in preparation for lobectomy

The difficulty of assessing the results of conservative treatment of bronchiectasis is that the signs of improvement are chiefly subjective. Of a series of 18 patients treated with a sulfonamide-penicillin suspension 14 had sufficient symptomatic relief to make a marked difference in their comfort and well being. The other 4 had from slight to moderate symptomatic relief. In no case has there been permanent relief of symptoms.

In suppurative pneumonitis and lung abscess intrabronchial therapy with a suspension of penicillin and sulfonamide in iodized oil has cured a significant proportion of cases. It is of special value in cases unsuitable for surgical interference.

SAMUEL KAHN, M.D.

Samson, P. C. and Burford, T. H.: Total Pulmonary Decortication: Its Evolution and Present Concepts of Indications and Operative Technique. *J. Thorac. Surg.*, 1947 16: 127

Early investigators recognized that the lung beneath the thickened membrane in chronic empyema frequently was normal and that expansion was prevented not so often by pulmonary disease as by the false membrane deposited on its surface. That the membrane removed by decortication was not thickened pleura but rather a tough fibrotic sheet which was firmly adherent to a relatively normal visceral pleura was recognized early by some workers but unfortunately the erroneous conception that it was "thickened pleura" has persisted almost to the present. The basic essentials of the operative technique described by Delorme near the turn of the century are embodied in present day techniques. Various procedures were described in association with decortication such as thoracoplasty pedicled muscle

transplantation and collapsing parietal procedures of various types, which indicated that at an earlier day the results of decortication procedures were not uniformly successful.

As the result of wide experience with hemothorax and its complications of organization and infection the indications for decortication have been broadened and the operative technique modified. Approximately 10 per cent of battle incurred traumatic hemothorax showed evidence of extensive clotting, and in nearly all of these cases there was some degree of organization. Clinical infection developed in a much larger proportion of clotted than in nonclotted hemothoraces.

The pathogenesis of hemo-organization begins with the laying down of a thin film of fibrin and blood cells over both pleural surfaces into which an angio-blastic and fibroblastic proliferation extends from the pleurae. The hemothorax thus becomes a closed hematoma of the pleural space, the wall of the envelope being composed of an ever thickening layer of fibroblastic and later fibrous tissue. The pleura itself does not become thickened but remains as a thin translucent grossly normal membrane (Fig. 1). Along the inner or younger surface of the membrane active fibroplasia continues and results in progressive thickening. When fully developed the membrane forms a tough inelastic membrane 1 or 2 cm in thickness and that portion of the envelope which invests the visceral pleura effectively prevents pulmonary re-expansion. In many cases, as weeks pass, the fibrosis increases and tufts of scar tissue extend through the pleura into the interstitial tissue of the lung. Hence a degree of cellular intimacy develops between the pleura and membrane so that it may be difficult or impossible to establish a cleavage plane and the invaded lung is only poorly expansile. Calcium may be deposited in the membrane within 3 or 4 weeks.

The success of early decortication depends upon these facts. The occurrence of infection in a hemothorax does not change the essential pathology of hemo-organization although a firmer thicker membrane develops more rapidly in cases in which infection supervenes. Hence in early empyema decortication performed as early as 11 or 12 days after injury has produced mature membranes. It is best to operate in from 3 to 5 weeks after injury in uninfected cases for if operation is done earlier the membrane is thin and friable and the operation becomes extremely tedious, while if it is done too late the fibrous union between the membrane and pleura prevents a clean separation and the lung is frequently torn.

The technique at operation does not differ appreciably whether or not infection is present in the hemothorax. Endotracheal anesthesia should be employed in all cases. The authors prefer an intercostal incision without section or resection of the ribs. The sixth intercostal space is usually the site of election for incision, but the fifth or seventh can be used according to whether better exposure is desired at the

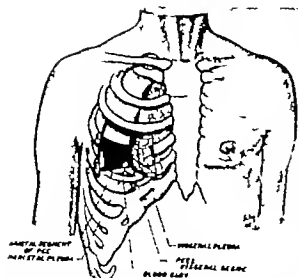


Fig. 1 (Samson, Burford) Schematic diagram showing relationship of an organizing hemothorax (closed intrapleural hematoma) to the collapsed right lung.

apex or at the base. The lung must be freed widely from the region of the incision otherwise extensive tearing will occur when the ribs are separated. All loculi are broken down and if no fistulas are present the cavity is cleansed with saline solution. A sharp incision is made through the fibroblastic membrane (peel) to the visceral pleura. If the lung is braced with moderate positive pressure this maneuver is facilitated. When the visceral pleura is reached the underlying lung will herniate through the incised membrane. During separation the main pressure is directed toward the membrane with either small gauze dissectors or the fingers (Fig. 6). Decortication is carried to the edge of the collapsed lung where the membrane reflects on to the parietal pleura. The fissures and apex are then freed and the lung is separated from the diaphragm, mediastinum and pericardium down to the hilum and pulmonary ligament. This is a most important part of the procedure. No attempt is made to remove the membrane from the parietal pleura for such a procedure has no effect on pulmonary re-expansion and the oozing of the blood is extensive and difficult to control. The diaphragm need not necessarily be decorticated but the cardiophrenic and costophrenic sulci should be re-established to increase diaphragmatic motion and aid in pulmonary re-expansion.

After the lung has been freed attention is given to necessary pulmonary surgery. Tears in the visceral pleura are repaired with interrupted fine silk sutures. Single superficial fistulas may be closed after freshening of the edges. Following decortication, intrapleural foreign bodies are readily palpable, although difficult to locate beneath the membrane in a compressed lung. Infected hematomas and abscesses usually are opened, the necrotic lining is re-

moved by dissection, and the dead space is eliminated by layered closure with fine silk. Wedge resections of these areas or total lobectomy may be necessary. In so far as possible, long sinus tracts in the lung must be laid open, the lining membrane cauterized, and the lung closed in layers. Mere closure of the superficial opening of the sinus tract will not suffice. Rib splinters or metallic fragments protruding into the pleural cavity are removed and a smooth surface is achieved.

Two and sometimes 3 intercostal watertight drains are inserted to maintain pulmonary expansion. Talcine injection of the 2 or 3 nerves above and below the incision is done. A layered closure is accomplished. Blood in amounts of from 1,000 to 2,000 c.c. is always given during the operation.

The postoperative care differs little from that in any major thoracic case. Deep breathing, forced expiration, and voluntary cough are mandatory. Irrigations or instillations are done. Systemic penicillin is given as long as necessary. It is of utmost importance that the intercostal tubes remain drainage. If a fistula develops one tube must be kept in place as long as the air leak continues. If a large empyema develops, as shown by a change to a parent drainage, dependent rib resection drainage should be established at once. A large airtight tube is inserted and attached to a water seal bottle to prevent secondary collapse of the lung.

Patients with an uninfected organizing hemothorax are observed and treated conservatively for from 4 to 6 weeks. Many of the conditions clear and become asymptomatic by the fifth or sixth week. Repeated aspirations are made and the removal of as little as from 50 to 100 c.c. of curd-like material from time to time is advantageous. If the situation becomes stationary at the end of 5 or 6 weeks, decortication is indicated if the patient presents all or part of the following picture: roentgenographic evidence of a generalized hazy chest, bilateral pulmonary compression of 50 per cent or more with a collapsed apex, poor thoracic expansion with retraction and narrowing of the intercostal spaces, diffuse thoracic pain or discomfort, and dyspnea on exertion.

The combination of foreign body retained in a well expanded upper lobe in association with a lower lobe still partially compressed by an organizing hemothorax is considered sufficient indication for decortication and removal of the mass.

In cases of infected organizing hemothorax in which the lung is compressed more than 25 per cent and particularly if the apex is collapsed, decortication should be done as soon as the patient's condition will permit. The difference between infected hemothorax and frank empyema is not great. In the latter instance the infection has been present for a longer period of time or may be more virulent. The author prefers to subject suitable cases to primary decortication without preliminary drainage since penicillin has come into general use. If the patient is profoundly toxic, preliminary rib resection drainage can

SURGERY OF THE THORAX

be done followed by decortication when the patient's condition permits.

Significant decortications were carried out on 125 patients 75 of whom had primary healing and complete pulmonary restoration without the development of recurrent empyema. Most residual empyemas were small and basal in location and responded well to rib resection drainage. When the lung was normal at the time of decortication primary cure was obtained in more than 90 per cent of the cases while in a group with associated pulmonary pathology about 40 per cent presented recurrent empyema. The operative mortality for approximately 1,500 operations is probably less than 2 per cent.

In the early phase, at least, of postpneumonic empyema the pleura is essentially normal. This fact suggests the use of early decortication in selected cases of subacute or impending chronic postpneumonic empysema. The indications should be those of a total or subtotal empyema with a collapsed apex or loculations of the exudate. No conclusions can be made concerning the use of decortication in cases of tuberculous empyema without parenchymal infection.

ORVILLE F. GRIMES, M.D.

HEART AND PERICARDIUM

Woll E., and Vickery A. L. Primary Fibrosarcoma of the Heart with Vertebral Metastasis. *Arch. Path., Chic.*, 1947 43 244.

A case of primary fibrosarcoma of the heart with a solitary metastasis involving the thoracic vertebrae is presented

MAHAIM'S TABLE OF PUBLISHED CASES OF PRIMARY TUMOR OF THE HEART AND THE PERICARDIUM

	Polypoid	Non-polypoid	Total
Heart			
Myxoma	82	23	105
Fibroma	8	29	37
Lipoma	4	10	14
Angioma (including lymphangioma)	4	9	13
Rhabdomyoma		60	60
Celothelioma (mesothelioma) of node of Tawara		5	5
Miscellaneous (cysts and other benign tumors)		8	8
Sarcoma	21	66	87
Total	119	210	329
Pericardium			
Fibroma	7		7
Lipoma	3		3
Angioma	10		10
Miscellaneous (cysts)	19		19
Celothelioma (malignant)	24		24
Sarcoma	20		20
Miscellaneous (malignant)	1		1
Total	84		84
			413

The above findings are suggestive or diagnostic of a tumor of the heart.

1. Unexplained and intractable cardiac failure which is often the first and the last
2. Unexplained and sometimes inconstant changes in cardiac rhythm sounds and size as judged by physical roentgen and electrocardiographic examinations.



Fig. 1 (Woll and Vickery) through the opened left atrium showing character of the growth.

Tumor seen from above. Note the strikingly oc-



Fig. 2 Microscopic view of the primary tumor. Note the lobulation, the whorled character of the fascicles, the abundance of collagen, and the wide variation of cell size and shape. (Eosin-methylene blue X93)

valvular disease Roentgen studies usually demonstrate the pleuropenocardial pericardiocostal or pericardiophrenic symphyses. Ordinarily the heart is small. Calcific plaques if accompanied by the classical clinical syndrome represent an absolute diagnostic sign. However this sign is frequently lacking as calcification is not always associated with chronic constrictive pericarditis.

The classical forms end fatally within a few years. Ordinarily the duration of life is between 4 and 6 years, during which time the symptoms become progressively worse. Frequently an infection or a pneumonic process hastens the end.

The adolescent form of disease is most amenable to surgery and the best results are obtained in these cases. The children present a fairly typical appearance with small limbs, long narrow faces, smooth white glabrous skin and infantile genital organs. Secondary sex characteristics are lacking. Menstruation either does not appear or is scanty and irregular. The surgical liberation of the heart gives most spectacular results for the growth and development of the child is quite rapid thereafter. The results of surgery upon the adult form are much less impressive.

The operative indications are quite precise if the acute fulminating and the slowly progressing well tolerated forms are excluded. However it is necessary to select an optimum time in the stage of the disease for operation. This problem involves the question of the role of tuberculosis in the genesis of the disease. Tuberculosis is undoubtedly a frequently encountered etiologic agent. Fluid obtained from acute pericardial effusions may show tubercle bacilli either by smear or by guinea pig inoculation. More often the typical tubercles giant cells, and organisms are found by histologic examination of tissue removed at operation or recovered at autopsy. Sometimes a postoperative military dissemination of the disease occurs and gives an exact clue to the bacillary nature of the process. Occasionally one can demonstrate other foci of infection antedating the pericardial involvement. However in 65 per cent of the author's cases careful observation at operation or at autopsy did not demonstrate such a tuberculous etiology. Nevertheless, when no precise etiologic agent can be demonstrated the authors believe that, in most instances, the cause is tuberculous, because tuberculous anatomically forms fibrous constrictions and calcifications. Other entities such as trauma, syphilis, or benign suppuration are without doubt causes of chronic constrictive pericarditis. Certainly the rheumatic etiology is uncommon for the adhesions are usually soft, loosely attached and nonconstrictive.

The tuberculous etiology then presupposes the elapse of a long period before surgery is considered for it is of paramount importance to operate only when the infection is overcome and the lesions are uninhabited by organisms. One risks nothing by the long delay for the myocardial damage is practically never irreversible one risks everything by operating too early. However there are no definite criteria to

determine if the lesion is quiescent and free of organisms. Certainly the existence of other visceral tuberculous lesions, the presence of pericardial fluid and the persistence of temperature with or without adenopathy are absolute contraindications to surgery. No particular sign indicates how long to delay operation. Usually however when the disease has advanced but little at least 18 to 24 months should elapse before operative intervention is attempted. The cytologic picture of pleural and pericardial fluids may aid somewhat for if no inflammatory cells are seen the fluid may be considered a mere transudate.

Local anesthesia is employed almost exclusively by the authors. In contrast to most American surgeons who favor extensive pericardectomies by carrying the excision of the fibrous tissue to the point of origin of the great vessels, these French surgeons believe that a limited pericardectomy which removes only that portion overlying the anterior aspect of the left ventricle is sufficient. The limited excision is easier less shocking and apparently sufficient for the distal repose of the left ventricle is the most important feature. The aorta at the level of the great vessels at the base of the heart is secondary to poor filling of the ventricle.

The authors emphasize that the pleura should not be injured. The use of gentle technique in resection of the ribs and left border of the sternum, with a midline approach to the pericardium and the use of moist sponges to reflect the pleura, aids in preventing its injury.

The authors' experience is derived from the study of 12 personal cases. In 6 of these perfect results were obtained. The results were less impressive in 2 adults of middle age with calcified pericardial lesions and in the 4 other cases in which recurrent pleural presumably tuberculous, infections occurred.

CEVILLE F. GRIMES, M.D.

ESOPHAGUS AND MEDIASTINUM

Thomas, M. A.: Webs and Constricting Bands in the Upper Esophagus (Sideropenic Dysphagia). *Am. J. Surg.* 1947 57 223.

The lesions which the author describes are either thin membranous webs which sweep partially across the lumen of the esophagus or narrow bands which encircle the esophagus and constrict the lumen. The condition is found, with few exceptions, in women and is often associated with essential hypochromic anemia. The postcricoid area is the most common site. The precise etiology has not been established. It is believed that they may be congenital or due to scar tissue forming after some abrasion of the mucosa either as the result of trauma or infection. However more complex etiologic factors seem to be involved. The association of anemia and dysphagia occurs most often. Superficial glossitis, cracking of the corners of the mouth, splenomegaly and achlorhydria may accompany the two predominant symptoms. A disturbance of the balance between the Mefasner

which no amount of medical therapy can benefit. Thirty patients had undergone one or more surgical operations previously for complications of peptic ulcer.

Usually the indications for resection were multiple, but in 39 cases the primary indication was pain in 20 cases obstruction. In 19 cases, bleeding in 7 cases, gastric ulcer without healing in 7 cases, wrong diagnosis in 1 case, perforation and in 1 case, gastrojejunocolic fistula. Gastric resection was not considered for the ulcer patient who was able to carry on full time work and whose condition could be well controlled with medical therapy.

At operation 70 duodenal ulcers, 21 gastric ulcers, 5 marginal ulcers and 1 gastrojejunocolic fistula were found. Ten patients had multiple ulcers. A walled off perforated ulcer was present in 59 per cent of the patients.

Preoperative and postoperative gastric acidity were studied and the average preoperative value was shown to be 50 U at 60 minutes. After surgery the average value was 5. In attempting to correlate the amount of stomach resected with the reduction of free hydrochloric acid a greater percentage of patients with achlorhydria was found among those with a two-thirds resection than among those with a three-fourths resection. The authors offer the explanation that the shorter afferent loop in the two-thirds resections may account for the above finding.

All gastrojejunal anastomoses were of the terminolateral orals totals type 99 were retrocolic. An associated enteroenterostomy was performed in 5 cases, 3 of which were of the en y type after partial jejunal resection for marginal ulcer. Pyloric exclusion was performed in 4 cases only, which reflects the authors opinion that the so called unremovable duodenal ulcers are not common.

Thirty-one per cent of the patients had postoperative complications. In 9 cases there was pulmonary infection, in 5 cases wound infection, and in 3 delayed function of the anastomosis. Obstructed anastomosis incomplete intestinal obstruction laryngeal edema pancreatic fistula, jaundice, wound separation evacuation, intra-abdominal abscess, ascites, and bleeding from the gastrointestinal tract were other complications.

There were 8 deaths. Of these, 5 occurred among patients in whom less than two-thirds of the stomach had been removed. It would appear that the magnitude of the resection per se does not increase the mortality rate. Two patients died because of cardiac failure and 6 died of peritonitis due to a breakdown of suture lines damage to the bile ducts, and wound infection. Case reports are presented of the 8 cases in which death occurred. From these the authors conclude that

1. A patient who has lost large amounts of blood over a period of time is a poor operative risk even though supported by many transfusions earlier operative intervention before succeeding exsanguinating hemorrhages will give a lower operative mortality

2. Gastric resection may be indicated even though the patient has severe heart disease if symptoms are severe enough.

3. Improvements in technique of pyloric stump closure may obviate the difficulty in obtaining a secure closure of the antral mucosa.

4. Poor healing is definitely related to a great blood loss and is responsible for separation of suture lines and fatal peritonitis.

Ninety two patients were available for follow-up studies. Of these 52 were examined later at the hospital and 7 were followed by letters. Using rather strict criteria, the authors found that 51 of the 59 patients were well, 4 were improved, and 4 had a recurrence. There was no evidence of recurrence in the 33 patients who were followed indirectly.

Studies of the 4 recurrent cases showed the presence of high gastric acidity. The authors believe a relative achlorhydria is necessary to prevent recurrent ulcer. It was believed that removal of an inadequate amount of the stomach was the cause of recurrence in 2 cases. In the remaining 2 cases, marginal ulcers were resected with re-establishment of continuity by the en y type of jejunostomy and recurrence was blamed on this type of anastomosis. Secretin is not produced because it is impossible for acid gastric juice to reach the duodenal mucosa. The buffering effect of bile and pancreatic juice is lost since these juices bypass the gastrojejunal anastomosis, leaving it exposed to the acid peptic digestive juice.

The authors report a direct relationship between recurrent ulcer and conservative surgery.

In the 30 patients in whom less than a two-thirds resection was done the recurrence rate was 13.3 per cent, while in the 80 patients with a two-thirds or more resection, the rate was 2.5 per cent. In 21 patients with ulcer which was treated by gastroenterostomy during the same period, the recurrence rate was 27.3 per cent.

Case reports of the 4 patients with recurrent ulcers are given in detail.

During 1944 and 1945 121 additional gastric resections were performed for ulcer and its complications. Forty-one patients had had previous surgery for peptic ulcer. In 31 cases the indication for resection was a severe complication of peptic ulcer or of previously inadequate surgical treatment. There were 4 deaths, a 1.6 per cent mortality. The authors attribute the decreased mortality to refinements in operative technique and careful attention to pre- and postoperative care. Two-thirds of the stomach was removed in a greater number of the patients in this group than in the previous group of 100. Follow up examinations in 92 per cent of this group, although short, have failed to reveal any recurrent ulcers. During this same period only 4 gastroenterostomies for ulcer were performed.

During the 5 year period from 1941 to 1945 the authors report a mortality rate of 4.5 per cent the ulcer recurrence rate was 1.8 per cent.

ROBERT R. BRIDGEMAN M.D.

Barrett M. K.: *Avenues of Approach to the Gastric Cancer Problem. J. Nat. Cancer Inst., 1946 7 127*

The greater number of deaths from cancer are among patients with gastric cancer (26,000 to 40,000 yearly). Since the problem is of major importance, the author has made a study of over a thousand articles and books in an effort to find suggestions for further clinical or experimental work. Factual knowledge of the major associations and relationships of gastric carcinoma are summarized in twelve sections as follows: Heredity, Diet and Vitamins, Hormones, Bacteriology, Gastritis, Pernicious Anemia, Achlorhydria, Ulcer, Gastric Polyps, Methods of Diagnosis, and Experimental Carcinogenesis. General suggestions are made for further study along various lines.

The most pressing need is for earlier diagnosis. With the best treatment, the average percentage of 5 year survivors is but 5 or 6 per cent. The author states that only one-half of all patients hospitalized or gastric cancer are operable, and of these, only one half of the cancers are resectable.

Methods feasible for attaining early diagnosis in a large number of cases are not now apparent.

FRANK B. QUEEN, M.D.

Wahren H.: Total Resection of the Carcinomatous Stomach. *Acta. chir. scand.* 1947 95 193

Total gastrectomy in cases of carcinoma of the fundus and upper corpus of the stomach is advocated by the author not only because subtotal resection *a priori* fails to fulfill the theoretical demands for radical treatment of a cancerous process but also because of the observations of Borrmann and of Eker who showed that cancer cells could be demonstrated in tissue as far as 5 cm. from the palpable tumor but appeared to be healthy macroscopically. According to various authors lymphatic metastases occur in from 36 to 75 per cent of the cases of ventriculoesophageal carcinoma.

Pentontitis originating in the anastomosis between the esophagus and the jejunum and/or the duodenum is probably the most usual cause of death following total gastrectomy. For this reason the author carefully preserves the ascending branch of the left gastric artery upon which the lower portion of the esophagus is dependent for its nutrition to a high degree, although such a maneuver lessens the possibility of effectively removing the lymphatics in the region of the cardia.

A technique of total gastrectomy and esophagojejunostomy through a subcostal, upper left abdominal incision is described. Section of both vagi and incision of the peritoneum anteriorly and posteriorly over the abdominal esophagus allows the surgeon to elongate the subdiaphragmatic portion of the esophagus some 5 to 7 cm. without too much traction. The esophageal stump is closed with steel wire and folded upward so that an anastomosis to the jejunum may be effected on its posterior surface. The author believes that extirpation of the spleen along with ventriculectomy as recommended by some

American surgeons, is irrational. Protein derivatives are given intravenously during the immediate postoperative phase.

Nine cases of total gastrectomy for carcinoma of the corpus are reviewed, all of the patients were discharged from the hospital in good condition. One patient was living 10 months after the operation, but showed evidence of metastasis to the liver. Three patients died in from 4 to 14 months of liver metastasis, and 1 other patient died after 4.5 months, but the cause of his death was not determined. The 4 remaining patients are living from 1 to 2 years postoperatively and are apparently well.

WAYNE CAMERON, M.D.

Puente Duany N. and Elizondo Martel G. Radiologic Aspects of Gastrointestinal Lymphosarcoma—Lymphoblastoma (Aspecto radiológico del linfocarcinoma—linfoblastoma—gastrointestinal). *Arch. cubanas cancerol.*, 1946, 5 361

Puente Duany and Elizondo Martel have made a very comprehensive clinical and radiological study of 23 cases of lymphosarcoma of the gastrointestinal tract. Twelve of the lesions were located in the intestine, 10 in the stomach, and 1 affected both segments. The article is illustrated by a large number of x ray reproductions and drawings of the different lesions found. Lymphosarcoma was found more frequently in the intestine, especially in the ileocecal valve, than in the stomach. With exception of the epithelioma, it is the most frequent tumor of the digestive tract. The lymphosarcomas of the gastrointestinal tract observed by the authors presented a localized form, a diffuse and multiple form with acute and chronic leucemia, a transitional form of mixed variety and acute or chronic leucemia of lymphoid or myeloid type.

From a pure anatomic point of view the gastric lymphosarcomas were classified in the following varieties: diffuse infiltrating ulcerative, polypoid multiple nodular and mixed. Some lymphosarcomas cause a peculiar form of the small intestine (more rare in the colon) with dilatation to form a sac at the site of the tumor which gives the appearance of an aneurysm. Microscopically the gastrointestinal sarcomas presented 3 distinct histological types: lymphocytic, lymphoblastic, and reticular depending upon which cells predominate.

As far as the diagnosis is concerned, 3 cases were found with manifest tumoral lesions of the stomach and intestine months after peripheral adenopathy had been discovered.

The radiologic characteristics of these tumors is discussed in detail.

The gastric localization presented itself under two modalities: the localized and the diffuse and multiple types. The first is confused systematically with carcinoma and ulcer; there is thickening of the submucosa with or without ulceration. In necrotic lesions there is no sharp limitation of the borders of the lesion. In the roentgenogram the diffuse and multiple variety presents not only the principal infiltrating tumor

which no amount of medical therapy can benefit. Thirty patients had undergone one or more surgical operations previously for complications of peptic ulcer.

Usually the indications for resection were multiple, but in 39 cases the primary indication was pain. In 30 cases, obstruction. In 19 cases, bleeding. In 7 cases, gastric ulcer without healing. In 7 cases, wrong diagnosis. In 1 case perforation and in 1 case gastrojejunocolic fistula. Gastric resection was not considered for the ulcer patient who was able to carry on full time work and whose condition could be well controlled with medical therapy.

At operation 70 duodenal ulcers, 21 gastric ulcers, 5 marginal ulcers and 1 gastrojejunocolic fistula were found. Ten patients had multiple ulcers. A walled off perforated ulcer was present in 59 per cent of the patients.

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Thirty-one per cent of the patients had nonfatal postoperative complications. In 9 cases there was pulmonary involvement. In 5 cases wound infection and in 3 delayed function of the anastomosis. Obstructed anastomosis, incomplete intestinal obstruction, laryngeal edema, pancreatic fistula, jaundice, wound separation, evisceration, intra-abdominal abscess, ascites, and bleeding from the gastrointestinal tract were other complications.

There were 8 deaths. Of these 5 occurred among patients in whom less than two-thirds of the stomach had been removed. It would appear that the magnitude of the resection per se does not increase the mortality rate. Two patients died because of cardiac failure and 6 died of peritonitis due to a breakdown of suture lines, damage to the bile ducts, and wound infection. Case reports are presented of the 8 cases in which death occurred. From these the authors conclude that:

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During 1944 and 1945 121 additional gastric resections were performed for ulcer and its complications. Forty-one patients had had previous surgery for peptic ulcer. In 31 cases the indication for resection was a severe complication of peptic ulcer or of previously inadequate surgical treatment. There were 2 deaths, a 1.6 per cent mortality. The authors attribute the decreased mortality to refinements in operative technique and careful attention to pre and postoperative care. Two-thirds of the stomach was removed in a greater number of the patients in this group than in the previous group of 100. Follow-up examinations in 93 per cent of this group although short have failed to reveal any recurrent ulcers. During this same period only 2 gastroenterostomies for ulcer were performed.

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FRANK B. QUINN, M.D.

Wahren, H. L. *Total Resection of the Carcinomatous Stomach. Acta chir scand.*, 1947 95 193

Total gastrectomy in cases of carcinoma of the fundus and upper corpus of the stomach is advocated by the author not only because subtotal resection, *a priori* fails to fulfill the theoretical demands for radical treatment of a cancerous process, but also because of the observations of Borrmann and of Eker who showed that cancer cells could be demonstrated in tissue as far as 5 cm. from the palpable tumor but appeared to be healthy macroscopically. According to various authors lymphatic metastases occur in from 36 to 75 per cent of the cases of ventriculo-carcinoma.

Pentinitis originating in the anastomosis between the esophagus and the jejunum and/or the duodenum is probably the most usual cause of death following total gastrectomy. For this reason the author carefully preserves the ascending branch of the left gastric artery upon which the lower portion of the esophagus is dependent for its nutrition to a high degree, although such a maneuver lessens the possibility of effectively removing the lymphatics in the region of the cardia.

A technique of total gastrectomy and esophago-jejunojejunostomy through a subcostal upper left abdominal incision is described. Section of both vagi and incision of the peritoneum anteriorly and posteriorly over the abdominal esophagus allows the surgeon to elongate the subdiaphragmatic portion of the esophagus some 5 to 7 cm. without too much traction. The esophageal stump is closed with steel wire and folded upward so that an anastomosis to the jejunum may be affected on its posterior surface. The author believes that extirpation of the spleen along with ventriculectomy as recommended by some

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From a pure anatomic point of view the gastric lymphosarcomas were classified in the following varieties: diffuse infiltrating, ulcerative, polypoid, multiple nodular and mixed. Some lymphosarcomas cause a peculiar form of the small intestine (more rare in the colon) with dilatation to form a sac at the site of the tumor which gives the appearance of an aneurysm. Microscopically the gastrointestinal sarcomas presented 3 distinct histological types: lymphocytic, lymphoblastic, and reticular depending upon which cells predominate.

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which no amount of medical therapy can benefit. Thirty patients had undergone one or more surgical operations previously for complications of peptic ulcer.

Usually the indications for resection were multiple, but in 39 cases the primary indication was pain in 20 cases, obstruction in 19 cases, bleeding in 7 cases, gastric ulcer without healing in 7 cases, wrong diagnosis in 1 case, perforation and in 1 case gastrojejunocolic fistula. Gastric resection was not considered for the ulcer patient who was able to carry on full time work and whose condition could be well controlled with medical therapy.

At operation 70 duodenal ulcers, 21 gastric ulcers, 5 marginal ulcers and 1 gastrojejunocolic fistula were found. Ten patients had multiple ulcers. A wall-off perforated ulcer was present in 59 per cent of the patients.

Preoperative and postoperative gastric acidity were studied and the average preoperative value was shown to be 50 U at 60 minutes. After surgery the average value was 5. In attempting to correlate the amount of stomach resected with the reduction of free hydrochloric acid, a greater percentage of patients with achlorhydria was found among those with a two-thirds resection than among those with a three-fourths resection. The authors offer the explanation that the shorter afferent loop in the two-thirds resections may account for the above finding.

All gastrojejunal anastomoses were of the termino-lateral, orals totalis type. 99 were retrocolic. An associated enterostomy was performed in 5 cases, 3 of which were of the en y type, after partial jejunal resection for marginal ulcer. Pyloric exclusion was performed in 4 cases only, which reflects the authors' opinion that the so-called irreparable duodenal ulcers are not common.

Thirty-one per cent of the patients had nonfatal postoperative complications. In 9 cases there was pulmonary involvement, in 5 cases wound infection and in 3 delayed function of the anastomosis. Obstructed anastomosis, incomplete intestinal obstruction, laryngeal edema, pancreatic fistula, jaundice, wound separation, evisceration, intra-abdominal abscess, ascites, and bleeding from the gastrointestinal tract were other complications.

There were 8 deaths. Of these 5 occurred among patients in whom less than two-thirds of the stomach had been removed. It would appear that the magnitude of the resection per se does not increase the mortality rate. Two patients died because of cardiac failure and 6 died of peritonitis due to a breakdown of suture lines, damage to the bile ducts, and wound infection. Case reports are presented of the 8 cases in which death occurred. From these the authors conclude that:

1. A patient who has lost large amounts of blood over a period of time is a poor operative risk even though supported by many transfusions earlier operative intervention before succeeding exsanguinating hemorrhages will give a lower operative mortality.

2. Gastric resection may be indicated even though the patient has severe heart disease if symptoms are severe enough.

3. Improvements in technique of pyloric stump closure may obviate the difficulty in obtaining a secure closure of the atrial mucosa.

4. Poor healing is definitely related to a great blood loss and is responsible for separation of suture lines and fatal peritonitis.

Ninety-two patients were available for follow-up studies. Of these 32 were examined later at the hospital and 7 were followed by letters. Using rather strict criteria, the authors found that 31 of the 59 patients were well, 4 were improved, and 4 had a recurrence. There was no evidence of recurrence in the 33 patients who were followed indirectly.

Studies of the 4 recurrent cases showed the presence of high gastric acidity. The authors believe a relative achlorhydria is necessary to prevent recurrent ulcer. It was believed that removal of an inadequate amount of the stomach was the cause of recurrence in 2 cases. In the remaining 2 cases, marginal ulcers were resected with re-establishment of continuity by the en y type of jejunostomy and recurrence was blamed on this type of anastomosis. Secretin is not produced because it is impossible for acid gastric juice to reach the duodenal mucosa. The buffering effect of bile and pancreatic juice is lost since these juices bypass the gastrojejunal anastomosis, leaving it exposed to the acid peptic digestive juice.

The authors report a direct relationship between recurrent ulcer and conservative surgery.

In the 50 patients in whom less than a two-thirds resection was done, the recurrence rate was 23.3 per cent while in the 86 patients with a two-thirds or more resection the rate was 5.9 per cent. In 21 patients with ulcer which was treated by gastroenterostomy during the same period the recurrence rate was 27.3 per cent.

Case reports of the 4 patients with recurrent ulcers are given in detail.

During 1914 and 1915 121 additional gastric resections were performed for ulcer and its complications. Forty-one patients had had previous surgery for peptic ulcer. In 31 cases the indication for resection was a severe complication of peptic ulcer or of previously inadequate surgical treatment. There were 2 deaths, a 1.6 per cent mortality. The authors attribute the decreased mortality to refinements in operative technique and careful attention to pre- and postoperative care. Two-thirds of the stomach was removed in a greater number of the patients in this group than in the previous group of 100. Follow-up examinations in 92 per cent of this group, although short, have failed to reveal any recurrent ulcers. During this same period only 2 gastroenterostomies for ulcer were performed.

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but also polypoid areas, ulcer and thickening of the folds of the mucosa. The hypertrophy of the mucosa is different from that in hypertrophic gastritis. In the latter condition the folds are more regular, less thick, and not accompanied by areas of tumoral infiltration. The roentgenologic aspects of these tumors in the duodenum, jejunum, ileum and colon are illustrated. Some of the lesions, especially those of the diffuse type, may appear in the first stages of lymphoid or myeloid leucemias of the acute or chronic variety but they are more common in the late stages. The importance of x ray therapy in the treatment of these tumors is emphasized. WILLIAM E. RICKERTS, M.D.

Klefer, E. D., and McKell, D. McC., Jr.: Peptic Ulcer in the Aged. *J Am Med Ass* 947 33 1955

It is a widespread clinical impression that peptic ulcer is predominately a disease of the young or middle aged and that it occurs comparatively infrequently in elderly patients. The authors quote statistics to show that this disease is proportionally as common in the elderly as in the young or middle aged. This article is based on a study of 158 patients over the age of 65 years in whom the diagnosis of peptic ulcer was made. In this series there were 11 duodenal, 36 gastric, and 4 postoperative ulcers.

Seventy-seven of these patients approximately one-half of the series, had their first symptoms of ulcer after their sixtieth birthday and 24 after their seventieth birthday. An analysis of the remaining 67 patients who had symptoms for over 5 years revealed that a very high proportion had moderate or severe symptoms. These elderly patients with a long history of symptoms were very prone to have a chronically perforated or calloused ulcer which was very resistant to treatment. The history of these elderly patients was often atypical as only 45 per cent of them had a history that could be considered characteristic of peptic ulcer.

In general the treatment of these patients followed routine lines. Malnutrition was especially common and weight loss was often marked. The diet in cases of this type should contain adequate protein, and fat may be used sparingly; the usual milk and cream mixture may be replaced by milk in many cases. Caution should be used in the use of soluble alkalies because of the danger of alkalosis in the presence of impaired renal function.

Organic obstruction requiring surgical treatment was quite common. Seventeen of the 158 patients with duodenal ulcer required gastroenterostomies for the relief of their obstructive symptoms. Gross hemorrhage is a particularly serious problem in this age group. The authors prefer a short period of sedation and fasting for from 24 to 48 hours before feedings are instituted. Of the 158 patients, 48 gave a history of hemorrhage and 17 had repeated hemorrhages. All patients were treated medically; no operative intervention for acute hemorrhage was carried out in this series and there were no immediate deaths. However, follow up studies showed a high

incidence of late recurrent hemorrhages after treatment, and in 4 instances the recurrent hemorrhage was fatal.

Except for the complication of hemorrhage the prognosis of peptic ulcer in this age group is about the same as for ulcer in any other age group. There was a recurrence rate of 33 per cent. 107 patients obtained complete relief; 28 were benefited but had recurrences and 4 were not benefited. Eight of these patients died as a result of their ulcer, of these 4 died because of hemorrhage, 1 of perforation, 3 died after operation and 1 died at home, the cause not being ascertained. Eighteen gastroenterostomies and 9 subtotal gastric resections were performed with 3 deaths.

The authors believe the only dependable proof of the benignity of an ulcer is to have it completely disappear under treatment.

F. J. LEBENHART, JR., M.D.

Kimble, S. T., Jr.: Protein Hydrolysate Therapy for Peptic Ulcers: Preliminary Report. *Gastroenterology* 1947 8 467

Considerable interest in the value of protein hydrolysate in treating peptic ulcer has been aroused since Co Tui's report in July 1945. His results in a series of 30 patients were so suggestive that additional study of the merit of this therapeutic technique was planned.

The author reports the results in a series of 15 ulcer patients treated with a 6 per cent solution of protein hydrolysate administered by gastric drip and venoclysis.

The protein hydrolysate is a heat-sterilized, stable pyrogen free, enzymatic derivative of beef. It contains no undigested proteins or proteoses, and a liter of the 6 per cent solution is equal to 60 gm. of protein.

The administration of protein hydrolysate varied from patient to patient. No therapy was instituted without x ray proof of the presence of an ulcer. In 11 cases the protein hydrolysate was administered by continuous drip through a Levine tube left in place in the stomach for 7 days. Five hundred cubic centimeters of hydrolysate were alternated with 600 c.c. of milk and cream, so the patient received 1,500 c.c. of hydrolysate (90 gm.) of protein and 1,800 c.c. of milk and cream in 24 hours.

Five patients were given the continuous drip for 7 days and then given venoclysis of protein hydrolysate (500 c.c. three times a day) for 3 or 4 days. One patient with hemorrhage on admission received 10 days of drip treatment followed by venoclysis. Four patients were given hydrolysate by vein alone (1,500 c.c. daily) supplemented with 3 oz. of milk and cream hourly during the day.

These patients received 143 gm. of protein daily by gastric drip and 126 gm. when the hydrolysate was administered by venoclysis, supplemented by milk and cream. As this was almost 3 times the daily protein requirement, these patients were assumed to be in positive nitrogen balance.

The emphasis was placed upon control of ulcer rather than cure. Patients were allowed bathroom

privileges smokers were allowed 6 cigarettes daily. Supplementary medications varied. Phenobarbital, belladonna, and ascorbic acid (200 mgm. daily) were routine. Sodium amyltal was given for sleep. Liver, iron, vitamins given orally and parenterally and transfusions were prescribed for hemorrhaging patients. After removal of the tube bland feedings were alternated with milk and cream.

In this study 13 patients had duodenal ulcers, 1 gastric ulcer alone and 1 combined duodenal and gastric ulcers. Nearly all possessed the physical and emotional characteristics of the ulcer type. The ages averaged 44 years with 30 and 69 being the extremes. There were 12 white males, 1 white female and 1 colored male in the series. Epigastric distress was the outstanding symptom in all cases and was present from 4 days to 15 years. Four patients had severe hemorrhage and 1 intractable vomiting before treatment. No patient had had previous surgery. Six had been treated unsuccessfully by bed rest and the Sippy diet.

Three complete case histories are given.

X ray check up studies were performed immediately after treatment with the hydrolysate was completed. In 9 cases the ulcer deformity had completely disappeared. Five cases showed marked improvement and 1 of these was completely healed 11 weeks later. Only 1 case failed to improve. In general, the higher the age of the patient and the longer the length of the ulcer history the more delay in healing.

The patients with hematemeia had no further bleeding after treatment was instituted. The one failure was believed to be due to an elevated histamine level accompanying an allergic state.

The total serum protein in 11 cases before therapy averaged 5.3 gm. per cent. After therapy the average was 6.9 gm. per cent. The average weight gain of 12 patients was 13½ pounds.

All but 1 of the patients were rendered completely free of ulcer symptoms during treatment. This was accomplished in from 12 to 96 hours.

Side reactions in administering 205 liters of protein hydrolysate were infrequent. When they were observed vomiting, frontal headaches, facial flush and nausea were usually due to running the effusion too fast.

Follow up studies are not complete but no case in which x ray evidence of ulcer completely disappeared had a recurrence. Only one of the patients is having symptoms, and these are mild. It is believed that protein hydrolysate is effective in treating the ulcer patient because it neutralizes gastric acid and adds to the supply of body protein. Follow up and control studies are being undertaken to confirm the long range value of this method of peptic ulcer therapy.

ROBERT R. BUCKLOW, M.D.

Hodges, H. H.: Protein Hydrolysate Therapy for Peptic Ulcer; a Report on 26 Cases. *Gastroenterol.* 33: 1947: 8-476.

Protein hydrolysate apparently has a beneficial effect in the treatment of peptic ulcer as reported by

Co-Tsu, Schenker and Clark and Vincl. It has been used in several different ways but its beneficial effect seems to be due to its buffering action and high nitrogen intake. The author presents this report as a critical evaluation of the effectiveness of oral administration of a protein hydrolysate in the treatment of chronic peptic ulcer and makes observations pertaining to nutrition and metabolism in human subjects whose sole source of dietary nitrogen was predigested protein.

Since February, 1946, 26 patients were selected for this study particularly on the basis of the chronicity of their ulcers. This group had failed to respond to the conventional dietary therapy on an ambulatory basis. Twenty three patients were hospitalized for the entire course of treatment and 1 patient was treated entirely as an outpatient. Hospitalized patients were allowed as much activity as they desired throughout the treatment period.

Twenty were males and 6 females; their ages ranging from 18 to 65 years. Eighteen had duodenal, 4 gastric and 3 stomal ulcers and 1 had an esophageal ulcer. The symptoms had been present from 4 months to 32 years. Five patients had prolonged gastric retention, 2 had vomiting, 3 recent evidence of bleeding and 5 clinical or x ray evidence of impending perforation.

A diagnosis of active ulcer was clearly indicated in all cases. In 23 cases this was confirmed by x ray studies and in 1 case by gastroscopy. In all but 3 cases follow up x ray studies were carried out after treatment for from 14 to 21 days.

The therapy consisted of frequent administration (at least every 2 hours) of an equal mixture of a proteolytate and dextrimaltose given daily. The average patient ingested 750 gm. of this mixture which yielded 285 gm. of protein, 2900 calories and 7.5 gm. of sodium chloride. The proteolytate is an enzymatic hydrolysate of casein. The dextrimaltose supplies only carbohydrate and calories.

Except in 4 instances no other food material was allowed during the treatment period of 14 to 21 days. Adequate vitamin supplements were provided routinely.

Complete relief of symptoms was obtained in 23 patients in an average of 4.4 days. In the remaining 3 patients the condition failed to respond or became worse. The treatment was discontinued after 2, 10 and 6 days, respectively.

In 12 of the 23 patients who became asymptomatic there was no roentgen evidence of ulcer activity after the 2 to 3 week treatment period and in 8 there was marked improvement but with some residual irritability or deformity without a crater. In 3 there was no x ray evidence of improvement.

A weight gain was usual the average being 4.5 pounds. Ten of 11 patients showed a diuresis during the last few days of treatment. Most patients showed a rise in the blood urea nitrogen levels but the serum protein and hemoglobin changes were constant. After treatment the degree of gastric acidity tended to be reduced. Individual feeding of

the mixture completely neutralized free gastric acid for an average of 70 minutes.

One patient suffered a serious gastrointestinal hemorrhage on the tenth day of treatment. Two patients suffered a mild diarrhea.

Although the taste of the hydrolysate is unpleasant no real difficulty was encountered on that account. The mixture did not seem to satisfy the normal sensation of hunger.

Of the 20 patients with x ray evidence of healing or improvement 5 had recurrence of the ulcer symptoms within 1 to 5 months. One patient was subjected to resection because of pyloric obstruction. Fourteen patients were asymptomatic for from 1 to 8 months. The 3 with no x ray evidence of improvement had prompt return of the ulcer symptoms and they as well as the 3 who failed to respond symptomatically were subjected to operation.

Evaluation of the results from the hydrolysate therapy is difficult and largely a matter of clinical impression. Three failures occurred in the 26 patients, although in the majority this treatment was more efficacious than a conventional dietary program in producing a remission. In several instances (1 case of esophageal ulcer) the prompt relief of symptoms and x-ray evidence of healing or disappearance of retention was dramatic.

It was the author's opinion that the frequency of relapses in ulcer patients was not diminished by this therapy. It is believed that the protein hydrolysate may become a useful adjunct to medical management of peptic ulcer particularly when surgery is contraindicated or as a therapeutic test for malignancy. However the expense of the present commercial preparations and the necessary vitamin supplements will preclude its routine use in most cases.

ROBERT R. BRIDLOW, M.D.

Trinca, A. J.: The Treatment of Acute Perforation in Peptic Ulcers. *Med. J. Australia* 947 355.

Five hundred and sixty-eight cases of surgically treated acute perforations of peptic ulcers are reviewed. Recognized factors influencing the mortality in such cases are listed as the age of the patient, the duration of the perforation, the general condition of the patient and the presence of intercurrent diseases. As the main theme of his article the author lists a fifth factor influencing the mortality, the factor which varies with the surgeon, namely the particular form of surgical treatment adopted. It is the contention of the author that the high mortality rates are due largely to incorrect surgical procedures.

In considering the pathology the author points out that the peritoneal cavity is only a potential cavity without dead space. When perforation of an ulcer occurs the gastric or duodenal contents pour out and contaminate the parietal and visceral peritoneum. The result is an immediate inflammatory reaction which can be divided into three somewhat overlapping stages. The first, "the hyperemic stage" is characterized by dilatation of formerly potential capillaries in the subperitoneal zone. Following this

the exudative stage" occurs in which a reactionary exudate forms in the subperitoneal zone. In this stage the irritation of the nerve endings produces intense pain and muscular rigidity of the boardlike abdomen. The third stage is "the plastic stage" in which fibrin is deposited in varying degrees upon the inflamed surfaces. It is pointed out that the thinness or the thickness of the exudate has no relation to its virulence.

The past literature is reviewed and quoted to bear out the author's contention that there is a natural resistance of the peritoneal cavity and that the exudate in the early stages of perforative peritonitis is purposive and protective and an adjunct to the peritoneal resistance. The exudate is antacid and antibacterial and delays absorption, and in some cases localizes the effects of infection. It is pointed out that attempts at removal of all the fluid at operation will result in increased mechanical irritation and possibly further dehydration of the patient. The bacterial peritonitis of the subperitoneal zone is inaccessible for drainage.

The literature is further reviewed to bear out the author's contention that for purely mechanical reasons the entire peritoneal cavity cannot be satisfactorily drained. The author suggests that the old dictum "When in doubt drain," should be altered to "When in doubt do not drain." The evil effects of the drainage tube are listed as (1) the production of duodenal, gastric, or ileal fistulas, (2) the production of ileus, (3) acute intestinal obstruction, (4) increased incidence of complications particularly subphrenic abscess and pneumonia, (5) delayed convalescence, (6) incisional hernia, and (7) late delayed intestinal obstruction from adhesions.

In the discussion of treatment the author contends that many of the fatalities could have been avoided by the adoption of proper preoperative treatment including the administration of fluids and the relief of pain. It is pointed out that bacterial peritonitis is a comparatively late manifestation and that operation can be deferred for periods up to 12 hours, if necessary to improve the patient's condition. The author states that he uses and prefers gas anesthesia because it produces less anesthetic shock and is less likely to produce pulmonary complications. He thinks that spinal anesthesia may also be used satisfactorily.

At operation the author prefers to use a simple, effective method of closing the perforation. A tag of omentum is isolated looped with a tie of 0 or 00 chromicized catgut, the two free ends of the gut are then threaded on curved needles and these are each passed into the perforation and back out through the gastric or duodenal wall. The suture is tied over the peritoneal surface and the plug of omentum is then introduced into the perforation. Extra sutures are placed about the margin of the omental tag affixing it to the serosal surface. Enough of the exudate is removed to render the perforation visible. Visible particles of food are removed. The author is convinced that the leaving of exudate is not the essential cause of residual abscess formation. Two indications

for the use of a drainage tube are listed namely (1) the inability to locate the perforation at operation and (2) the presence of a localized collection of pus such as in subphrenic abscess.

In addition to the above mentioned points in treatment, the author states that patients can be further benefited by the preparation of a culture from the exudate and the use of appropriate chemotherapeutic measures to combat infection if peritonitis is well established. Modern methods to maintain fluid balance, promote retention of chlorides and to relieve intestinal distention should be adopted.

The statistics presented show that the mortality rate in the cases with drainage was more than 3 times as great as that in the cases without drainage. Factors such as age and duration of the perforation did not invalidate the statistics but further strengthened the case against drainage. Complications were shown to be 3 times as great when drainage was used. The average stay in the hospital was half as long again with drainage. W. FOSTER MONTGOMERY M.D.

Thompson Harold Lincoln; and Prout, Harry: Surgical Treatment of Peptic Ulcer; Recent Experience at Los Angeles General Hospital. *Arch. Surg.* 1947 54 390

The authors present an exhaustive and detailed study of the surgical treatment of peptic ulcer as carried out during the latter part of the war years at the Los Angeles General Hospital.

It is noteworthy that during this period only 22 per cent of the patients with peptic ulcer were treated surgically. This figure includes cases of acute perforation and indicates that a relatively small proportion of routine peptic ulcer patients require surgery.

Röntgenologic examination was an adjunct diagnostic aid of considerable value although in 8 per cent of the cases there was an x ray diagnostic error.

The authors note that in 6 simple or uncomplicated cases of peptic ulcer radical gastric resection was performed with a mortality of 50 per cent. A more careful evaluation of the operative attack and the pathologic status of the ulcer is suggested and this is important in a hospital where a large number of surgeons are engaged in the treatment of "service cases." An over-all surgical mortality rate of 19.3 per cent is reported. This figure is considered in the light of civilian surgery performed at a charity hospital during wartime conditions. Not only was the type of patient different during the war but a serious shortage of surgical and nursing services greatly aggravated a difficult situation.

The statistics given are shown by means of graphic designs and pictures. EDWARD F. LEWIS M.D.

Lagos García Alberto; and Díaz Bobillo, Manuel U: Complete Volvulus of the Small Intestine in the Newborn (Vólvulo total del intestino delgado en el recién nacido). *Sem. méd.*, B. Air., 1947 54 341

The study of volvulus in the newborn is intimately related to the anomalies of the embryological devel-

opment of the small intestine, as this constitutes the predominating factor in intestinal torsion.

The authors report a case of complete volvulus of the entire small intestine occurring in a two day old female who persistently vomited an abundant amount of bile stained fluid. Loss of weight and constipation were present. On physical examination a poorly nourished, poorly developed and dehydrated baby was seen. The fontanelles were sunken the abdomen was globular in shape, with visible peristaltic waves traveling from left to right in the epigastrium. A flat plate roentgenogram revealed an excessive quantity of gas in the small intestine, while, after the ingestion of a barium meal, one could see a dilatation of the stomach and first portion of the duodenum, with a retention after 48 hours. A barium enema showed the ascending colon and cecum located under the transverse colon.

Preoperatively the patient was prepared with plasma, saline and glucose, and a gastric lavage. Under ether anesthesia a right paramedian incision was made supraumbilically and the peritoneal cavity was entered. A small amount of milk-colored fluid escaped signifying a probable block of the lymphatics. The cecum and ascending colon was found beneath the transverse colon. Although a complete volvulus of the small intestine was found the color was normal. The small bowel was rotated over 360 in the opposite direction of its twist, and the abdomen was closed. Postoperatively there was no vomiting and the patient gained weight.

Of great importance in the diagnosis of volvulus in the newborn is the x ray findings, which are as follows: (1) dilatation of the gastric portion, and first and second parts of the duodenum (2) complete or partial obstruction at the level of the third part of the duodenum and (3) the duodenum is located entirely to the right of the midline which implies an anomaly of intestinal rotation. A barium enema is likewise important as it may show an abnormal position of the cecum in the epigastrium or right hypochondrium.

Conditions to be differentiated although they likewise are surgical are hypertrophic pyloric stenosis, annular pancreas stenosis and congenital atresia of the duodenum. ANTONIO F. CIPOLLA, M.D.

Rosenak, S. and Hollander, F. Early Postoperative Motor Response of the Small Intestine to Jejunal Feedings. *Surg. Clin. N. America*, 1947 27 343

The purpose of the present study was to evaluate the small bowel motility in jejunostomy patients during the first 2 days following operation. Intra-jejunal alimentation in surgery of the gastrointestinal tract is a major factor in improving the early postoperative nutritional status of the patient, and thereby influencing the convalescent state and power of tissue repair.

Of importance in the increased use of surgical jejunostomy and orojejunal intubation is the recent improvement in the type of feeding mixtures em-

ployed for this purpose. A newer predigested synthetic aliment advocated by the authors has eliminated in great part the diarrhea, cramps, and other gastrointestinal disturbances associated with the administration of earlier types of jejunostomy feeding mixtures. The authors also stress the important point that whenever jejunostomy is performed for alimentation, the feedings should be instituted as soon after operation as physiological considerations permit.

If a physiologic precept that during the first few days after abdominal operations patients suffer some impairment in the threefold functions of the gastrointestinal tract, namely secretion, absorption, and motility. The authors: a series of long term studies are attempting to determine whether or not the extent of such physiologic impairment is great enough to invalidate the use of intrajejunal feeding during the early postoperative period.

In order to study the motor activity of the gastrointestinal tract a series of x-rays were taken of patients with surgical jejunostomy. It was the objective of the study to determine whether the massive introduction into the jejunum of 100 c.c. of aliment (with barium added) is normally transported at a rate sufficient to permit its routine administration. All conditions were carefully controlled and x-rays were taken at 1, 2, and 3, from 5 to 10, and from 20 to 24 hours following the injection. Control studies were repeated from 3 to 5 weeks after operation.

In interpreting the results of this study the authors indicate that the time normally required for chyme to travel through the small bowel is highly variable and subject to influence by medication and many other factors. However they conclude that jejunal feedings with their predigested synthetic aliment may be instituted as early as 24 hours postoperatively provided certain precautions are taken. The absence of retrograde movement of the aliment as shown by x-ray visualization indicates that this feeding procedure does not jeopardize the intactness of the duodenal stump.

During the early days following operation the administration of jejunostomy aliment is safe if special precautions are taken regarding the volume and rate of administration. Low and F. LEWIS, M.D.

Booher, R. J. and Pack, G. T. Cysts of the Duodenum. *Arch Surg* 1946, 53, 584

The authors report two types of duodenal cyst: a true enterogenous cyst of the duodenum and a cyst of Brunner's glands. This situation is rarely reported in the literature. Including the cases in this report there have been 13 cases of enterogenous cysts of the duodenum described since the initial case of Sanger and Klopff in 1880. Of the cases reported, 2 occurred in males and 8 in females, and in 2 there were no records of sex. The ages of the patients varied from newborn to 17 years.

The incidence of duodenal cysts. Low. Robertson found 2 instances of cystic dilatation of Brunner's glands in gross examination of 15,000 cases. Ackerman reported the incidence of diverticula of the duo-

denum discovered at autopsy as varying from 3.3 per cent of 1,367 cases (Leinsmeyer) to 15.5 per cent (Schuppel) and an incidence on roentgenologic examination varying from 0.016 per cent of 72,715 cases (Rankin and Martin) to 5.19 per cent of 770 cases (Cryderman). He found an even higher incidence by making plaster molds of the duodenum of cadavers—11 diverticula in 50 consecutive cases or an incidence of 22 per cent. Yet he made no mention of finding the embryologic counterpart or sequela, i.e. an enteric cyst. Pachman reviewing 36 cases of enterocyst found 28 cases of cysts of the terminal ileum or ileocecal area as compared with 8 in the duodenum. Ladd and Gross, in 1940, reported 18 patients with cystic lesions in various parts of the intestinal canal but only 1 cyst was in the duodenum.

Robertson, discussing the degeneration and infiltration of Brunner's glands, states that the outstanding characteristic of the glands is their comparative freedom from influences which ordinarily affect secreting tissues. Occasionally there is stasis of secretion with dilated ducts and acini. In some cases this is evidently because of obstruction to the duct. It has been observed in the region of invading or metastatic tumor nodules and on the margin of chronic or healed ulcers. Such a condition may lead to cyst formation in which acini or even an entire lobule may be dilated and contain a mass of cell detritus mixed with varying amounts of mucus. These cysts are lined with low cuboidal cells, and the cavities are largely free from stainable substances.

There are several theories of causation of enterogenous cysts. Lewis and Thyng concluded that "knoblike" diverticula occur regularly in the embryo and that they usually degenerate and some times formed detached cysts and nodules. It was believed that these structures might give rise to pathologic diverticula. Orgias concluded that the cyst is a developmental cyst of the duodenum and has developed as a diverticulum of the first part of the duodenum. Evans concluded that because these cysts reproduce the structure of the bowel they are derived from the gut and are developmental. Hughes-Jones proposed the theory of epithelial sequestration as a possible origin. The authors make the statement that if these "knoblike" diverticula or misplaced or displaced enteric anlagen, are the source of origin for both cysts and diverticula, it is surprising that primary diverticula of the duodenum are so frequent and cysts so uncommon.

By definition, the walls of these cysts correspond to the structure of the intestinal canal. They present well defined muscular coats and glandular linings, and although intracystic pressure may cause atrophy and flattening of the glands, the glands of Brunner are apparent.

Enterogenous cysts may occur anywhere in the wall of the bowel or in the mesentery and are classified as submucosal, intramucosal, subperitoneal and intra-mesenteric. They have occurred most frequently in the second portion of the duodenum but

have extended up to the pylorus and have arisen behind the first portion. The size has varied from the size of a walnut to that containing 500 c.c. of fluid. The average size has been between 6 and 7 cm. in diameter.

All patients with enterogenous cysts have present signs and symptoms of duodenal obstruction. Persistent vomiting or regurgitation has been a predominant symptom occurring with pain in 3 cases. In 9 a tumor had been palpable. According to Gardner and Hart the most important diagnostic signs were palpable tumor and signs of duodenal obstruction. Ladd and Gross observed that most cysts of the duodenum jejunum and ileum brought early signs of intestinal obstruction, characterized by colicky pain, vomiting, increased peristalsis and finally signs relating to dehydration. Cysts of Brunner's glands are usually asymptomatic.

Röntgenologically the findings vary from none to a round central filling defect of the second portion of the duodenum but with nothing characteristic to differentiate it from papilloma or polypoid benign tumor of the wall.

Treatment consists in surgical removal. This is effected in 2 of 4 ways: (1) duodenal resection with the adjacent cyst; (2) enucleation or excision; (3) simple evacuation or (4) marsupialization. In the authors' case the cyst was successfully enucleated. This procedure cannot be carried out without difficulty because of the lack of a good line of cleavage and the dangers of perforation of the viscus or laceration of the wall and transverse closure of the duodenostomy in the longitudinal plane relieved the fear of jeopardizing the viability of the bowel wall. Miller enucleated 10 cysts of the ileocecal region without a death.

Of the 6 survivors of the 13 collected cases, 3 have had resection of the adjacent duodenum, 3 had local excision, 1 survivor had gastrojejunostomy after drainage of the cyst and 1 had enterocystostomy with successful results. This represents an operative mortality of 45.4 per cent and a case mortality of 53.8 per cent.

Enucleation of cysts of Brunner's glands is not attended with the difficulties inherent in the management of enterogenous cysts, and simple enucleation is sufficient.

EDWIN W. PASSARELLI, M.D.

Blum, L.: Nontumid Ileocolic Intussusception in an Adult. Report of a Case with Cecal Ulcer. *Surg. Clin. A. America* 1947 27 355.

The author presents a case of nontumid intussusception in a middle aged adult and discusses the factors of pathogenesis. A brief survey of the literature reveals that between 5 and 10 per cent of all cases of intussusception occur in adults.

Most cases of intussusception in adults are associated with a bowel tumor either inflammatory or

neoplastic. The author points out that there is no disagreement as to the mechanism of this process in the presence of a tumor. The normal pattern of peristaltic activity could be expected to invaginate the mass whether intramural or intraluminal, into the segment of bowel immediately below thus initiating the process of intussusception.

However when there is no anatomic abnormality of that portion of the intestine which forms the apex of the intussusception it is not easy to formulate an acceptable etiologic theory. Since 97 per cent of all cases start near the ileocecal junction, the author mentions the following concepts of pathogenesis:

1 That the ileocecal valve normally projects through the wall of the cecum so that during the discharge of intestinal contents it telescopes into the lumen of the large gut. When due to some derangement of intestinal rhythm this may become marked the process may overreach itself and an intussusception of the usual type with the ileocecal valve as the apex can be so started.

2 That the base of the appendix due to a local inflammatory process can similarly be the initial point and drag the adjacent ileocecal valve with it as the forefront of the intussusception.

3 That the lymphoid tissue aggregates (Peyer's patches) which are of considerable size during the first year of life and may persist in an enlarged form, serve as intramural tumors and start the process in the last inch or two of the ileum.

4 That the slope of the mesentery that is the angle at which the ileum joins with the cecum may tend to precipitate invagination of the small into the large bowel, and that the reason for its predominance in the male is related to the more obtuse ileocolic angle in infants of this sex.

5 That the mesentery may be unusually long and that the peritoneum enclosing the ascending colon may be unusually lax, resulting in a mobile cecum.

The author does not mention the concept that vigorous peristalsis at the ileocecal junction is often countered by antiperistalsis in the cecum which may lead to intussusception. However he does suggest that functional derangements of the luteine can be postulated on a neurogenic basis. The ileocecal region is believed to be the junction of the vagal and sacral portions of the parasympathetic system. The writer believes that intussusception might result from disturbed peristalsis at the neural junction.

The case reported was that of a middle aged male who had a nontumid intussusception which was treated by a stage operative resection of the terminal part of the ileum, ascending colon and part of the transverse colon with recovery.

EDWARD F. LEWIS, M.D.

Pack, G. T., and Booher, R. J.: Intussuscepting Submucous Lipoma of the Right Colon. *Surg. Clin. A. America* 1947 27 361.

Something will have been accomplished by this article if the surgeon's attention will have been

directed to the possibility of the presence of intussuscepting submucous lipoma of the right colon either prior to or during operation when he is face to face with an obscure abdominal case (Stetten)

In cases of obscure abdominal pain occurring intermittently for a long time with intervening episodes of complete freedom from pain, and with signs and symptoms of transitory obstruction associated with a palpable mass especially in the right half of the colon, a tentative diagnosis of intussusception due to benign tumor may be in order

A total of 133 cases of submucous lipoma, situated in the area from and including the ileocecal valve to the rectum has been previously reported.

Two cases of submucous lipoma of the colon are reported, one tumor arising from the ileocecal valve and producing chronic obstruction on the basis of intermittent redicible intussusception, and the other arising in the ascending colon and producing intermittent transitory intussusception.

JOHN J. MALONEY M.D.

McNealy R. W. and Landa, V. G. Primary Anastomosis in the Treatment of Carcinoma of the Colon *Surgery* 947 183.

Thirty four consecutive cases of open anastomosis of various parts of the large bowel, with but 3 deaths, neither directly attributable to surgery are reported. In none was colectomy used.

There were 4 carcinomas of the right colon 3 of the transverse colon 11 of the sigmoid, 8 of the recto-sigmoid, and 1 carcinoma of the splenic flexure.

Details of the preoperative and postoperative management of both the obstructive (7) and the non-obstructive cases are presented. Close attention is given to succinylsulfaiazole prophylaxis and to protein, hemoglobin and vitamin levels "the entire problem of primary anastomosis revolves intimately about the newer concepts of adequate preoperative and postoperative management.

The operative procedures, with illustrative drawings are discussed and the use of a minimum of sutures, in two layers and well disposed, is urged.

The author believes that the low mortality, the shortened hospital stay, elimination of multiple operations, and the saving of time, expense, and psychic trauma make the primary open anastomosis the recommended operation in resectable nonobstructive carcinoma of the colon. FRANK B. QUEK, M.D.

D Allaines, F., and Carrillo-Maurtua, L.: Colectomy with Immediate Anastomosis in the Treatment of Cancer of the Left Half of the Colon (La colectomie et anastomose immédiate dans le traitement du cancer du colon gauche) *J. chir. Par* 946 6 429

For the past few years one of the authors, convinced of the disadvantages inherent in the procedure of exteriorization, endeavored to perform resections with primary anastomosis in the treatment of cancer of the left colon. These operations carried out in one or two stages are now regarded as entirely

satisfactory. Safe and comfortable, they deserve to be better known.

In order to decrease the risk of colectomy on the left side it became imperative not only to improve the technique of anastomosis but also to perform the operation in stages with either exteriorization or diversion of the fecal stream before resection was attempted.

With the number of failures steadily increasing, any method less dangerous than the colectomy of Reybard was considered very safe. The operation of exteriorization was readily accepted. Statistics published since 1934 representing 450 resections done by 13 different surgeons, reveal that the mortality rate in these operations averaged 20 per cent. Their safety therefore is more apparent than real.

It is the authors opinion that the real disadvantages of exteriorization operations are (1) the necessity of several operations, (2) the necessity of establishing a temporary colectomy for several months (this is not without risk) (3) each operation carries a certain mortality rate and (4) the operations require a prolonged hospital stay. The authors agree that exteriorization is sometimes the procedure of choice, but they believe that it is a dangerous operation.

The writers believe with Pierre Duval that colectomy in one stage means resection of the colon and re-establishment of continuity at the same operative session regardless of whether or not it is preceded by diversion of the fecal stream proximal to the suture line of anastomosis. The techniques of left colectomy in one stage are so numerous that classification is difficult.

Certain techniques of colectomy in one stage do not call for diversion of the fecal stream. The anastomosis may be exteriorized (Senèque) or simply returned to its normal place in the abdomen. The latter procedure could be called the modified operation of Reybard because the anastomosis is often side-to-side and is often aseptic. These operations require abdominal or lumbar drainage and aspiration through the Miller Abbott tube or through a tube inserted through the anus up and above the suture line. The procedure of left colectomy in one stage without prior diversion of the fecal stream is commonly used in certain countries with excellent results. Most of the techniques of left colectomy in one stage call for diversion of the fecal stream by means of a fistula.

The safety of the one stage operation is now well established. In a series of 543 colectomies performed by 15 different surgeons, the mortality rate was 10 per cent. However the operations will not enjoy such safety unless the cases are judiciously selected.

The authors report a series of 15 one stage left colectomies for cancer without death or postoperative complications. There were 3 cases in which there was no diversion of the fecal stream. In 7 cases diversion of the fecal stream was established at the time of resection and anastomosis. In the remaining 3 cases diversion was instituted prior to the colectomy.

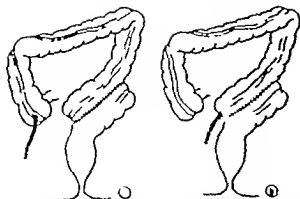


Fig. 1. (D Allaine and Carillo-Maurtua) The temporary diversion. a, Diversion by cecostomy is sufficient when the colon is not distended. b, Proximal diversion just above the anastomosis. The proximal end of the bowel is closed on a De Pezzer catheter. It must be employed when the colon is distended at the time of operation.

Left colectomy in one stage with contemporary diversion was suggested by one of the authors in 1943. It consists of segmental resection of the left colon followed by a side-to-side anastomosis which is protected by a contemporary diversion performed proximal to the line of anastomosis. The retroperitoneal spaces are dusted with sulfonamide drugs and may or may not be drained through a contralateral lumbar incision.

The authors believe that the technique of Wangenstein should be used only in favorable cases and even then diversion of the fecal stream is advisable because the latter procedure carries only a few disadvantages and adds to the safety of the operation. Contemporary diversion of the fecal stream prevents tension on the suture line. The fistula can be easily closed as soon as feces have gone through the anastomosis unless such closure occurs spontaneously, which frequently occurs.

For the establishment of such diversion the authors at first used the colonic segment just proximal to the anastomosis. This provided excellent diversion and prevented distention of the suture line. However in later cases the simple cecostomy has been preferred because of parietal complications observed in a patient who had an inflammatory growth of the colon. At the present time diversion just proximal to the anastomosis is used only if the afferent colon seems distended at the time of the operation.

In spite of the protection assured by diversion of the fecal stream, it is imperative that the anastomosis meets all the requirements of strength, permeability and elasticity. The side-to-side anastomosis is the procedure of choice when it is from 10 to 12 cm. in length and performed with interrupted sutures. Thus it will never be exposed to the dangers of obstruction due to edema. The main advantages of this anastomosis is the length of the stoma and the assurance of an adequate blood supply. However it is not without disadvantages as it requires a great deal of tissue. Such a problem however can be

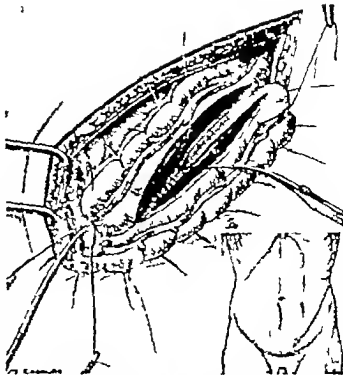


Fig. 2. The long side-to-side anastomosis with interrupted sutures. The seroserosal row has been completed, the total posterior row of sutures has been started. This figure also shows the diversion just proximal to the anastomosis below the incision in the abdominal wall. It is important to identify and safeguard the left meter.

solved relatively easily if one is careful in mobilizing the colon. The anastomosis is performed with 2 rows of sutures placed in such a manner that the knots can be tied inside of the lumen of the bowel. The so-called closed or aseptic techniques constitute a great step forward in the technique of bowel anastomosis.

Once completed the anastomosis may be exteriorized extraperitonealized, fixed to the peritoneum, drained or simply returned to its normal place in the abdomen and the abdomen closed without drainage.

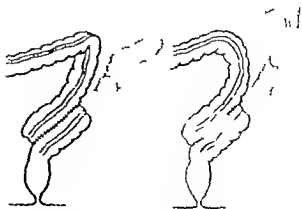


Fig. 3. The operation in two stages, second method. The unbroken line is the first stage and the dotted line is the second stage.

The authors believe that if the cases are properly selected and the anastomosis is adequately performed any procedure devised to protect the peritoneum presents more disadvantages than advantages. Such preventive measures are indicated only if the strength of the anastomosis is questionable.

Drainage of the retroperitoneal spaces is a matter of controversy. The authors use drains in obese patients in which mobilization of the colon is tedious and difficult or when it is impossible to secure good hemostasis. In the average case the instillation of sulfonamide drugs is sufficient.

In a thin subject with a thin mesocolon resection of the colon is done before resection of the mesocolon. The vessels of the mesocolon are divided separately between small clamps of the Leriche type. Unfortunately such a maneuver is very difficult in obese patients with a thick mesocolon in which the vessels are not apparent. In these instances, the authors proceed in the following manner: first section of the proximal colon, then section of the mesocolon, and last, section of the distal colon. The resected segment takes the shape of an isosceles triangle, the base of which, at the colon, must measure at least 7 cm. on each side of the growth.

Section of the colon is accomplished with the electric knife after the bowel has been crushed. For the latter procedure the clamp of Goetze is preferred to the De Martel crusher which is not always as easy to put into place. The distal end of the bowel is always closed with 3 rows of size 00. chromic catgut; the proximal end is treated in a different manner depending on whether or not diversion is necessary. If diversion is decided upon the end of the bowel is closed on a De Pesser catheter and fixed to the peritoneum. If cecostomy is to be performed the proximal end is then closed in the same manner as the distal end.

After completion of the posterior seroserosal row, the bowel is opened for 10 or 12 cm. The lumen of the bowel is thoroughly cleaned with pads saturated with ether as suggested by Locene. For the insertion of the total row of sutures the authors advocate the use of linen inserted with Bergeret's needle. The sutures are placed close together and inserted in such a fashion as to have the knot inside of the lumen. The anastomosis is completed by suturing the anterior seroserosal row again with fine linen. The anastomosis is dropped into the abdomen. The rent in the mesocolon is obliterated and a sulfonamide drug is dusted into the retroperitoneal spaces.

The wall is usually closed without peritoneal drainage. Before the skin is closed a few grams of sulfonamide are deposited on the line of sutures in the fascia.

The cecum is "fistulized" and a De Pesser catheter is buried in the wall of the cecum according to Fontan's technique. The cecum is then fixed to the parietal peritoneum. In certain cases the cecostomy must precede the colectomy.

Due to the extent of the cancer or the poor condition of the patient the ideal resection is often

contraindicated. To overcome the disadvantages of an exteriorization operation a two stage procedure preceded by anastomosis has been suggested by one of the authors. There are two methods. The first consists of a colocolic anastomosis, followed by resection of the segment of bowel bearing the growth as the second operation. Unfortunately the second stage is very laborious because of the great number of adhesions around the anastomosis, the growth, and the mesocolon.

In the first stage of the second method the transverse colon is resected and a side-to-side transverse sigmoidostomy is performed distal to the growth. The second stage is easy as a rule. It consists of resection of the left end of the transverse colon and the growth with the corresponding mesocolon.

The authors have learned by experience that these two operations have different indications. The second method is feasible only when there is no obstruction. On the other hand the first method is especially indicated in cases of partial obstruction; however its value today is being questioned by the authors since a simple cecostomy followed by a one or two stage colectomy may be a better procedure.

The two stage left colectomy without exteriorization has been performed 6 times by the authors for the treatment of cancer. Both methods were used in 3 cases and no deaths occurred.

In the 2 stage operation without exteriorization the same technique and surgical principles with respect to the anastomosis are followed in the first stage as in the one stage procedure.

The anastomosis must be 10 or 12 cm. in length and two rows of interrupted sutures are necessary. The rent in the mesocolon is obliterated and the abdominal wall is closed without drainage.

Resection of the cancerous segment is done in the second stage. A period of from 2 to 3 weeks is allowed to elapse between the two stages. A transverse or a left oblique lateral incision is made according to the location of the tumor in the splenic flexure or the descending colon.

After complete mobilization of the growth, the colon is resected between the anastomosis and the tumor; the corresponding mesocolon being removed. The end of the colon is then closed, a sulfonamide is dusted in the retroperitoneal spaces, and the abdominal wall is closed without drainage.

For the same operation, the superiority of the modern statistics is explained mostly by the progress made in the preoperative and postoperative treatment. The use of penicillin and succinylsulfathiazole associated with a high protein intake is of great value. The authors state that they have as yet been unable to use several of the wonderful drugs so popular in the Anglo-Saxon countries.

The authors advocate the following preoperative measures. Ascorbic acid in daily dosage of from 300 to 500 mgm. and from 5 to 20 mgm. of vitamin B are prescribed daily until complete wound healing has taken place. Whole blood plasma, and intravenous solutions are of great value to correct de-

iciencies. No amino acid preparations are available as yet in France. A laxative is administered daily properly for from 5 to 8 days in order to keep the bowels empty.

The postoperative treatment is somewhat similar to that used for any major operation in the abdomen.

In the last part of their article the authors discuss the indications for the various operations employed in the radical treatment of cancer of the left colon except rectosigmoid cancer.

Colectomy in one stage with contemporary diversion is contemplated only if the patient is in good condition with no co-existing pathology and is under 70 years of age. For old and weak patients with co-existing lesions such a procedure is contraindicated.

The results of the preoperative treatment are of great importance in selecting the type of operation. Some patients first thought to be unsuitable for colectomy in one stage meet the operative requirements at the completion of the preoperative treatment.

The general condition of the patients may justify such an operation but certain problems must be considered and solved by the physical examination, the x-ray studies and the operative findings. The location of the growth is irrelevant but a palpable tumor must be considered with caution. Laparotomy in these cases will show the invasion and mobility of the tumor. The operation is contraindicated in the presence of subocclusive phenomena. Infection also represents a definite contraindication for colectomy in one stage. The patient must remain afebrile and have a white blood count which is within the normal limits.

As a rule, the finding of metastasis contraindicates radical surgery because the hope of curing the patient is fallacious.

When the growth is resectable and when a single and small metastasis is found a one stage colectomy should be preferred to a two stage operation should one decide to operate, because the disadvantages of an operation in stages should not be imposed on a patient whose life expectancy is limited.

As to the indications of the operation in two stages without exteriorization any patient who carries a resectable cancer of the left colon should be given the benefit of a two stage operation if he is more than 70 years of age or if he is in poor general condition. However such an operation is sometimes necessary on a relatively young patient in good general condition because of fixity of the growth in the rectum or the presence of bowel obstruction.

The operation in two stages (second method) is reserved for the nonobstructed patient. The existence of obstruction demands an emergency colectomy. Later on a one or two stage colectomy is performed.

The operations with exteriorization have very limited indications according to the authors. They should be reserved for cases with growths fixed to neighboring structures or those in which operability is questionable.

GERARD GAGNON, M.D.

Wright L. T. Freeman W. A., and Bolden J. V.: Lymphogranulomatous Strictures of the Rectum. A Résumé of 476 Cases. *Arch. Surg.* 1946 53 499.

The authors have studied a series of 476 consecutive cases of fibrous inflammatory stricture of the rectum due to lymphogranuloma venereum at the Harlem Hospital, New York, New York, during the 15 year period from 1930 to 1945.

The causative agent of the disease is a filtrable virus which can be cultivated on chick embryo mediums. Rodanische, by experiments with cross immunizations indicated that there were 7 strains of the virus and subsequently, Palmer Kinsner and Rodanische identified 5 strains in material studied by them. In the series studied here 437 patients were women 453 were Negroes. The highest incidence occurred in patients between 30 and 40 years of age.

The primary infection as noted by Fren David and Grace may take place in men by pederasty and in women by infection of the vagina or cervix and lymphatic vessels of which drain directly into the perirectal or pelvic glands.

Gerota found that the anogenitoinguinal lymphatic system communicates with the rectum by multiple anastomoses and that in the lateral wall of the rectum, in all the tunica muscularis between the latter and the fascia rectoprocta immediately above the insertion of the levator ani, there are 6 to 8 lymph glands which receive lymph from the lower portion of the rectum. These glands are now called the glands of Gerota.

Bartels and Biberstein have produced data to show that the superficial lymphatic network of the vulva goes to the superficial inguinal glands and that the abundant network of the clitoris passes to the deep inguinal nodes and a few of these directly to the external iliac and hypogastric nodes. The posterior part of the vulva has also direct lymph pathways to the anal network of glands, which drain partly into the inguinal glands, partly into the anorectal glands and partly omitting these glands, directly into the third of the vagina. The lymph vessels of the lower upper portions pass mainly to the middle and gastric glands while some pass directly to the anorectal glands. The lymph vessels of the uterus go directly to the preaortic and sacral glands. Lymph glands which leave the rectal wall above the insertion of the peritoneum flow to the mesorectal lymph glands and the glands of Gerota. Many lymph vessels lead rectally through the fascia of the rectum to the hemorrhoidal vessel. Bartels and Biberstein have also pointed out that the virus of lymphogranuloma venereum is able to produce a proliferative stimulus in the surrounding tissue. There are few anastomoses between the right and left sides and between the superficial and deep lymphatic vessels. It has been noted that chronic lymphostasis leads to a disturbance of nutrition in the affected regions. Bloom

concluded that obstruction of the lymph pathways leading to the inguinal gland causes a diversion of the lymph stream toward the rectum, and thus the infection is shunted to Gerota's glands.

Schreiner Beiner pointed out that in women there is a connection between the vaginal plexus and the hemorrhoidal plexus through the pudendal veins, so that infectious material usually passes from the vulva to the rectum.

Most authors are of the opinion that a determining factor in the production of rectal strictures is a resultant disturbance in the lymphatic flow produced by the infection.

It is the authors' opinion that lymphostasis plays an important role in the pathogenesis of rectal strictures in three ways: (1) blockage of the lymph glands and interference with adequate drainage, (2) involvement of the lymph channels themselves, due to the action of the virus, and (3) a specific scar tissue producing action of the virus. Sufficient evidence has not yet been produced to show why in some instances, the condition is progressive to the point where it threatens life itself. In other instances, why it progresses to the point where it becomes a serious clinical problem of importance but ceases to progress beyond this point and finally why in some instances it is a relatively benign chronic disease. The authors believe that these features can be explained, in the light of present knowledge, only on the basis of the action of different strains of the virus and the reaction of the particular host. The complex reactions involved between different strains of the virus and the immunity reactions of the host are facts still to be elucidated.

The stricture is usually cylindrical in shape. Its length varies from 1 to 5 cm. Usually it is located 3 to 4 cm. above the anus but it has been found at 8 and 12 cm. Ordinarily it appears as a sort of funnel with a variable sized opening at the apex of the funnel. On proctoscopic examination, ulceration may be noticed on the surface of the stricture. At the point of stricture the rectal wall is usually grayish in appearance, and rigid if the stricture is well advanced, while in the early stages it exhibits reddened granulomatous patches and often congestion and edema. Fissures and condylomas around the anus are common. Perianal fistulas are not unusual. Microscopically the muscularis undergoes degeneration and becomes replaced by scar tissue, a subacute inflammatory process, which spreads between the normal elements of the tissue, following the vascular and lymphatic systems, compressing and destroying them. Masses of purulent exudate are present, with polynuclear leucocytes, debris or epithelial cells, red cells, and clusters of bacteria. The submucosa is destroyed, and in it one finds round cell infiltration. Deeper there are areas of round cell infiltration, groups of polynuclear leucocytes, eosinophils, mast cells, and many plasma cells. Nodular masses, which are often palpable, are composed chiefly of round cells and have a center which often softens and takes on all the appearance of tuberculosis. Palpable for

mation is not unusual, and this feature is used as a basis for diagnosis. In short, the appearance is that of a chronic granuloma of the rectum.

The pathologic changes of the disease, aside from the gross evidence of stricture in the rectum, consist in the early stages of a reddened friable mucosa which bleeds easily on touch or proctoscopic examination and is due to thickening and ulceration. The thickening involves all layers of the rectal wall mucosa, submucosa, and tunica. Often the three layers are fused into a hard and thickened, dense mass, in which the normal histology of the rectum is lost. The scar tissue extends deeply into the adjacent perirectal tissues, and if fistulous formation is present the scar tissue extends along the tract, or tracts, to the external surface of the body. The usual site of the fistulas is below the stricture, although it has been demonstrated that they may occur above it. Proximal to the stricture there is ulceration and dilatation of the rectum or sigmoid in proportion to the degree of stenosis, with superimposed, mixed secondary infection. The obstruction to the fecal outflow plus the secondary infection is the cause of many of the secondary symptoms presented by the patients, as low grade fever, constipation, anemia, weakness, dehydration and malnutrition.

The diagnosis in cases of pure uncomplicated strictures of the rectum is made by the examining finger. External manifestations of the disease, as elephantiasis of the vulva, anal tags, fistulas, cockscomb tumors, or papillomatous tumors around the anus which are obviously of a benign nature, demand in all cases a rectal examination. In most cases examination shows the rectal wall to be thickened and narrowed. The lumen may admit the tip of the index finger or there may be almost complete occlusion, which will barely permit the passage of a urethral catheter. The diagnosis may be confirmed by proctoscopic examination if an anal stricture does not preclude the use of the instrument. The Frei test was used in this series of patients and was positive in 77 per cent. Although it is an important adjunct in the diagnosis of the disease it is not absolutely specific, and negative reactions occur in a sufficient number of cases so that absolute reliance cannot be placed in the test. Some negative reactions are due to faulty technique because positive reactions have been obtained on retesting. The Frei test should be done in all cases of suspected strictures and, when positive, is a most important confirmatory diagnostic aid. If negative, it is important to repeat the test with potent antigen and scrupulously careful technique. The cultivation of the virus from the rectal mucosa obtained from the site of the stricture makes the diagnosis absolute. Hyperproteinemia with a definite increase in the serum globulins in excess of 3.5 per cent is a suggestive diagnostic sign of lymphogranuloma venereum. The reversal of the albumin-globulin ratio in early and late cases, which persists as long as active infection remains, has been stressed. The sedimentation rate has not been of diagnostic help.

Biopsy should be used in two ways (1) to rule out the presence of a coexisting carcinoma which occurs as a superimposed factor in a significant number of patients, and (2) to isolate the virus when laboratory facilities make this possible. Except for the finding of a low grade anemia and an increased sedimentation rate in those with secondary infection the other laboratory findings are, in general, normal. Roentgenological examination by barium enema will demonstrate the stricture as to location and length. A disadvantage of this technique is that the barium may become inspissated and aggravate the clinical condition. To obviate this a balloon filled with sodium iodide has been passed through low strictures and the films taken.

The signs and symptoms obviously vary according to the location and degree of the stricture.

The differential diagnosis of lymphogranuloma venereum considers intestinal tuberculosis, ulcerative colitis, carcinoma of the rectum, diverticulitis, chemical strictures and rarely in this country strictures due to parasites or amebic ulcers.

As to the prognosis of the disease rectal strictures are the most serious clinical condition that results. Many persons in whom strictures of the rectum develop live to an extremely old age. In other instances, the stenosis not only causes disability and prolonged morbidity but is the real cause of death. The disease is progressive at times, often it is apparently static, and in the present light of our knowledge it is impossible for anyone to separate with accuracy the conditions that will progress and those that will not. Tuberculosis develops as a death producing factor in many cases pneumonia is a serious factor in other instances. Acute and chronic intestinal obstruction develops not infrequently. Rectal strictures are a common cause of death, but often the death producing factor is not considered to be the stricture because of other complications.

Treatment consists in the use of drugs, biologic methods and surgery.

Of the drugs used none have been impressive in their results. However the use of the sulfonamide drugs in the prestricture stage of the disease may in some instances prevent further progress of the condition and in this way stop the formation of strictures, but this evidence is not conclusive. Sulfathiazole, sulfanilyl sulfanilate, succinylsulfathiazole, and phtalylsulfathiazole will clear up much of the super imposed secondary infection and thus improve the condition of the patient.

Biologic methods consist in the use of antigens, estrogens, irradiation, diathermy and solid carbon dioxide.

Frei antigen is still recommended by some clinicians. In this series it has proved valueless, having been used in over 200 cases without effect.

Estrogens have been used on the basis that pregnancy seemed to help rectal strictures by causing a softening of the genital, pelvic, and perineal tissues during childbirth. This has been refuted by observation of other series of patients.

Irradiation is mentioned because patients have been seen who have received radium therapy. From the results observed there was no lessening of the progress of the condition.

There are many reports of the successful use of diathermy in this disease. It has been used in the present series of patients with totally unsatisfactory results.

Solid carbon dioxide was used for a long time and discarded because it served no useful purpose.

Some conditions do not progress rapidly and are not serious, while others progress rapidly in spite of all forms of therapy except early excision. Colostomy helps many patients by (1) lessening secondary infection, and (2) overcoming the toxic effects of chronic obstruction of the bowel. Surgical treatment alone is of value once a fibrous stricture of any considerable extent has developed. Warten's obliteration of the cul-de-sac operation offers the possibility of lessening the complications that are inherent in colostomies, namely anterior grade and retrograde herniation. It cannot prevent stenosis of the colostomy opening which occurs in many instances. Pauchet's excision operation, or a modification thereof at this time offers the best method of cure for strictures low in the rectum. This does not exclude the sacroperineal excision operation of Hartmann. These operations are of such magnitude that they should be performed only by experienced surgeons. When the disease involves the entire rectum and the rectosigmoid area, abdominoperineal extirpation is indicated if the patient a clinical condition does not improve after colostomy. In the rare cases in which the descending colon is involved, a permanent artificial anus in the transverse colon should be made.

Much further study is needed to complete our knowledge and understanding of this subject.

EDWIN W. PARSANELLI, M.D.

LIVER, GALL BLADDER, PANCREAS, AND SPLEEN

Pignatelli, G.: Research on Fibrinogen in Surgical Affections of the Biliary Tract (*La ricerca del fibrinogeno nelle affezioni chirurgiche delle vie biliari*) *Gior Ital chir* 1947 3 130.

A study was made of 18 patients with affections of the biliary system in which the blood fibrinogen and the glycemie curve as a control were used as an index of liver function.

Fasting blood was taken the day before surgery and repeated 15 days and 2 to 3 months later for the determination of the glycemie curve and the blood fibrinogen. The method of Hagedorn and Jensen was adopted for determination of the glycemie curve while the technique originated by Whipple and Foster was used for the blood fibrinogen.

The author's observations were as follows (1) chronic cholecystitis of long duration presented a noted diminution of fibrinogen accompanied by an alteration of the glycemie curve, indicating a lesion of liver parenchyma as a result of the chronic inflam-

matory process however 15 days postoperatively the blood fibrinogen and the glycemic curve returned to normal. (2) In one case of jaundice resulting from a tumor of the head of the pancreas the fibrinogen was diminished to nearly half the normal parallel with a great alteration in the glycemic curve. (3) In 2 instances of postoperative biliary fistula the fibrinogen was diminished, but returned to normal after closure of the fistula. (4) In cholelithiasis without jaundice, there was no appreciable alteration in the blood fibrinogen or the glycemic curve.

The author's studies show that fibrinogen represents a good index of liver function in those cases with an inflammatory process of long duration and a return to normal of the blood fibrinogen and the glycemic curve after the beneficial effect of surgical intervention. However, in cases of fatty degeneration of the liver parenchyma, a normal or increased value of blood fibrinogen may be found.

ARTHUR F. COPIOLA, M.D.

Cattell, R. B.: Strictures of the Biliary Ducts. *J. Am. M. Ass.* 1947 34 35

The operative intervention to restore normal bile flow into the intestinal tract in benign strictures of the biliary ducts presents many technical problems which tax the ingenuity of the surgeon.

A short review of the literature on this subject is presented.

The incidence of benign stricture is difficult to determine accurately. At the Lahey clinic, in Boston, only 1 stricture in 5,000 operations on the gall bladder was encountered. The ratio was to 50 when compared with gall bladder operations during a 4 year period. The ratio of benign stricture to obstruction of the biliary ducts due to cancer is 1 to 5.

A series of 123 patients with benign stricture of the biliary ducts operated on at the Lahey Clinic prior to January 1, 1945 was used as the basis of this report. Eighty per cent of the patients were women, the youngest was 21, the oldest 75 years, and 30 per cent were less than 40 years of age.

Strictures were due to operative injury in 99 cases (80%). The author believes that these certainly should be preventable. They may occur as the result of poor anesthesia, uncontrolled hemorrhage from the cystic artery, inadequate exposure and light, failure to recognize the anatomic variations of entrance of the cystic duct into the common duct, or distorted anatomy due to a badly inflamed or contracted gall bladder. In order to avoid these accidents the surgeon should completely demonstrate all anatomy before attempting the division of any structures. Although cholecystectomy is the operation of choice for a patient with gall stones, cholecystostomy is indicated if the surgeon believes that satisfactory dissection is impossible because of the risk of injury to the duct.

Hemorrhage from the cystic artery during operation with blind attempts at control, frequently results in injury to the common hepatic duct. This

can be avoided by pressure on the hepatic artery, compressing it between a finger in the foramen of Winslow and the thumb anteriorly on the gastrohepatic omentum until the cystic artery stump can be secured.

Explorations of the common bile ducts during operations on the gall bladder have not contributed to stricture formation.

The site of stricture was the common bile duct, or both hepatic ducts in 49 patients. The lower end of the common duct was injured in a localized area in 32 patients. Large portions of the extrahepatic ducts were found to be excised in 18 cases. Injuries at the site of cystic duct entrance were due to interference with the lumen of the duct because of too close ligation of the cystic duct or removal of a portion of the duct at this point.

In 11 patients, long-standing inflammation of the ducts resulted in stricture. Earlier operative interference in these long-standing cases of biliary disease might have prevented strictures. Fibrosis and narrowing of the ampulla of Vater was the cause of stricture in 9 patients—a cause which is frequently overlooked unless it is determined by the passage of graduated probes or transnodal exploration. Adhesions and external trauma were infrequent causes of strictures.

The time for effecting a repair is very important. Repair of operative injuries is best accomplished at the time of the original operation. If the injury is discovered during the postoperative period, it is better to wait until the inflammation and edema subside when strictures are pliable. Many failures are the result of too early interference. If there is an external biliary fistula, operation should be delayed at least 3 months. If obstructive jaundice persists, operation should be carried out in from 4 to 6 weeks. Every attempt at repair if unsuccessful, makes later procedures more hazardous.

In the presence of an external biliary fistula, a short period of preoperative preparation is necessary. In severe obstructive jaundice 2 or 3 weeks' preparation may be necessary to get the patient in the best operative condition. A high caloric, high protein, low fat diet, augmented by vitamins B, C, and K, is recommended. Intravenous dextrose, amino acid mixtures, and blood transfusions are given preoperatively if indicated.

The author prefers fractional spinal anesthesia and uses tetracaine hydrochloride weighted with dextrose. If general anesthesia is required, intratracheal cyclopropane is preferred.

A total of 344 operative procedures on 123 patients were carried out, 280 of the operations having been done prior to the patient's admission to the Lahey Clinic. The serious nature of duct strictures is shown by the extent and number of surgical procedures, the severe hepatic damage and the long period of disability with economic loss.

All operative repairs consisted of (1) plastic procedures with end-to-end suture for restoration of continuity and preservation of the sphincter of Oddi,

or (3) suturing of the proximal portion of the duct to some portion of the gastrointestinal tract (stomach duodenum or jejunum)

The principles of treatment for a successful repair are given in detail. Whenever possible the author employs a procedure which preserves the sphincteric action at the ampulla. The difficulties involved in locating the lower end of the duct can be overcome with increasing experience. Adequate portions of the distal duct can be obtained; the duodenum is mobilized drawn forward and turned to the left. The anterior division of the superior duodenal artery can be sectioned and the pancreas split so that the intra-pancreatic portion of the common duct may be identified and dissected free for 2.5 to 5 cm. the mobility of this portion of duct enables its approximation to a short proximal stump without tension.

The author divides his series in two groups which differ chiefly in that there is a great increase in end-to-end sutures in the latter group. The transplantation of fistulas has been discontinued. In the author's last 38 cases (not included in this series) anastomosis of the duct to the gastrointestinal tract was not done except in rare cases.

The type of material over which the anastomosis is made is unimportant since all will pass. Rubber T tubes, vitallium or bouncing clay tubes have been used successfully. The tubes should have as large a lumen as possible to avoid plugging. When a T tube is used it is left in place from 6 to 12 months.

Anastomosis of the duct to the gastrointestinal tract was carried out in 28 cases. Hepaticojejunos-tomy is the procedure of choice. The author uses a long loop of jejunum antecolic with an enteroenterostomy or the Y-loop or Roux principle.

Postoperative care is similar to that following any serious abdominal operation. Vitamin K is given parenterally for 1 week. Blood transfusions and infusions of dextrose and amino acids are given when indicated. The drainage of bile from the wound usually ends in 2 weeks. A choleagogue is used for several months if a tube is left in the duct system. If a T tube is used it is irrigated with saline twice daily after the first week.

In the first group of 80 patients there were 14 deaths, and in the second group of 43 cases there were 3 deaths. The reduced mortality is attributed to improved pre- and postoperative care, the use of vitamin K, and increasing operative experience.

The longer the cases are followed the greater the recurrence of symptoms. A follow up of 21 patients with anastomosis of the duct to the gastrointestinal tract showed completely satisfactory results in 12 patients, 4 were improved, 9 were unimproved and of these 8 were reoperated upon. There were 4 deaths in this group.

Of the 30 patients with repair by vitallium tube, in 7 the duct was anastomosed to the intestine and in 23 the duct was reunited over the tube. Satisfactory results were obtained in 25 cases. There were 3 deaths; it was necessary to remove the tube in 2 cases, and the tube was passed in 2 cases.

The most satisfactory results followed end-to-end repair of the duct or plastic repair of the duct over a T tube. Recurrence of stricture may take place at any time and require reoperation.

ROBERT R. BROWNE, M.D.

Stajano, C.: Congenital Dilatation of the Hepatic Duct and Main Duct (Megacholedochus) (Dilatación congénita del hepato-cóldoco-megacóldoco) *Boi Soc cir Uruguay* 1946 17 261

Stajano reports a very interesting case of congenital dilatation of the main duct. The patient was a 25 year old pregnant woman who had mild gastrointestinal and urticarial symptoms during the first months of pregnancy but in the ninth month she had frequent vomiting and pain in the dorsal column. She delivered a normal child. Thirteen days after delivery she had marked distention in the right upper quadrant of the abdomen. On palpation a cystlike mass of the size of the head of a fetus was felt which was thought to be a hydatid cyst of the liver. An eosinophilia of 5 per cent was found and the Cassini test was slightly positive.

The patient was followed up in the hospital for nearly 6 weeks, during which time the mass increased in size and in tenderness. The pain radiated to the epigastrium and the posterior base of the thorax. At



Fig. 1 (Stajano) Cholangiography of an enormously large dilated congenital main duct.

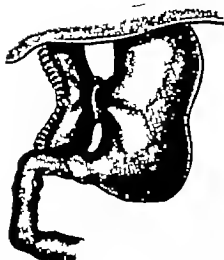


Fig. 2. (Stajano) Appearance of the successfully resected congenital main duct which was anastomosed to the stomach and duodenum in tubelike form.

operation an enormous dilatation of the main duct which contained nearly 600 c.c. of black bile was found this was drained. In a second operation a large portion of the main duct was resected, and a tubelike structure was made and anastomosed to the stomach and duodenum (Fig. 2). The patient made an uneventful recovery and 3 months later was symptomless and had gained 8 pounds in weight.

WILLIAM E. RIZZETTA, M.D.

Hicken N. F. White, L. B. and Corry Q. B.: Incomplete Removal of the Cystic Duct as a Factor in Producing Postcholecystectomy Complications. *Surgery* 94:7 399.

Whenever a gall bladder becomes diseased the pathological process invariably spreads to the cystic duct. Therefore the authors conclude that the entire cystic duct should be removed with the diseased gall bladder. The fact that this is not invariably done and secondary operations become necessary is attested to by numerous case reports in the literature. Failure to appreciate the anatomic anomalies of the cystic duct is often responsible for failure to remove it. However any abnormality of the cystic duct can be detected accurately by taking cholangiograms during the operation, a procedure which the authors advocate in all doubtful cases.

The residual cystic duct may become dilated and form an excellent receptacle for bile but as the duct lacks the contractile properties of the gall bladder it cannot evacuate its contents. Stasis infection and stone formation result. Or the cystic duct may harbor an undetected stone at the time of the initial operation, which later causes serious symptoms. And finally adhesions to the residual cystic duct may cause serious kinking of the common duct with resultant symptoms of obstruction. The authors

present case reports illustrating each of these mechanisms.

F. J. LUTHEMAN, JR., M.D.

Senty P., and Duroux, P. E.: Removal of the Ampulla of Vater in the Course of Gastroduodenectomy for the Curative Treatment of Ulcer (La déssection de l'ampoule de Vater au cours de la gastroduodénectomie pour ulcère. Traitement curatif). *Lyon chir* 1947 42 13.

Injury to the common bile duct and the pancreatic duct of Winsung is a real hazard in the course of gastroduodenectomy for ulcer particularly for ulcers of the posterior wall which perforate into the pancreas. Wounds of the terminal portions of these ducts may easily be overlooked at the time of operation and readily prove fatal. If they are recognized at the time of injury their immediate repair is not difficult.

Attempts to repair such injury may be in the nature of anatomical restoration, a biliary side tracking procedure, or fistula anastomosis. Anatomical restoration can be done only when the ducts are injured several millimeters above the ampulla of Vater and the ampulla is left intact, and is accomplished by anastomosis of the cut ends of the ducts over small catheters.

Biliary side tracking procedures such as cholecystoduodenostomy with ligation of the common bile duct provide for the flow of bile but do not provide for the flow of pancreatic juice. On the other hand, pancreatic fistula anastomosis is a practical method of restoring the pancreatic duct but does not provide for the flow of bile.

The authors have devised the following procedure to accomplish restoration of both ducts. Once the injury to the ducts is recognized, the duodenum is sectioned below the ulcer bearing area while the anterior wall is left as long as possible, and the cut end of the duodenum is drawn down over the base of the pancreas and the ampullary portion in such a fashion that the severed canals empty into the intestinal lumen. The duodenal wall is anastomosed to the end of the pancreas with three layers of sutures. Good suspension of the afferent limb of the gastrojejunostomy aids in the prevention of regurgitation and a temporary cholecystostomy allows decompression of the biliary tree.

The advantages of this procedure are that it controls both the pancreatic and biliary duct systems, establishes a normal physiologic pathway for the flow of biliary and pancreatic juices, avoids cholecystoduodenostomy and does not prolong the operating time.

Four patients have been treated by this method and have done well for periods of 5 years, 4 years, 3 years, and 6 months. EDWARD W. GIBBS, M.D.

Wirts, C. W., Jr., and Snape W. J.: Disseminated Calcification of the Pancreas. Subacute and Chronic Pancreatitis. *Am J Med Sc.* 94:7 13 390.

The incidence of pancreatic lithiasis is not high aggregate figures showed only 31 cases among

117,031 routine autopsies. The authors wish to draw attention to a special form of pancreatic lithiasis known as disseminated calcification of the pancreas. This disease is thought to be distinct from the usual form of pancreatic lithiasis.

The cause of this disease is not known, but it is generally believed to result from repeated attacks of acute or subacute pancreatitis occurring in adult life. Pathologically the pancreas shows the presence of extensive interlobular and intralobular fibrosis, with considerable mononuclear cell infiltration. The parenchyma of the gland is largely replaced by this fibrosis. The entire ductal system, including the smallest ducts, contains minute calculi.

The outstanding symptom of disseminated calcification of the pancreas is abdominal pain, usually existing over a period of months or years. The pain is usually gnawing and boring in character and is present in the epigastrium with radiation to the back. Particularly severe attacks of pain may arise following an excessive intake of alcohol.

Steatorrhea and creatorrhea are present in about 25 per cent of the cases. When they persist for any length of time, weakness and weight loss may be pronounced. Transient jaundice may occur. Diabetes is rarely present (2 of the 24 reported cases).

The most significant laboratory finding is a diminished pancreatic secretion following the intravenous injection of secretin. Steatorrhea and creatorrhea may be present. The typical roentgen ray picture shows a diffuse stippled calcification involving the entire pancreas.

Relief of the acute symptoms usually requires the administration of morphine. If true pancreatic insufficiency is present, a low fat, high caloric diet, with vitamin therapy and large doses of pancreatin are beneficial. Partial or total pancreatectomy may be necessary for intolerable pain. One of the greatest benefits occurring from the proper recognition of this disease is that it may prevent the needless removal of a gall bladder, appendix or kidney. Two case histories are given. F. J. LEEMAN, JR., M.D.

GYNECOLOGY

UTERUS

Falconer B.: Investigations on the Uterine Mucosa. Biopsy Material, Its Treatment and Evaluation. *Acta obst. gyn. scand.*, 946, 26 453.

The author points out changes which may occur in biopsy material as a result of preparation and calls attention to some peculiarities in the microscopic picture. He states that the technique by which the biopsy material was obtained should be known to the pathologist since there is a difference both in quantity and in the amount of injury to the mucosa, depending upon how the specimen was obtained. The use of the suction curette may remove only small bits of mucosa and its removal may be more superficial than by curettage and hence less reliable for interpretation of abnormal changes.

The changes produced in biopsy material by curettage are the following (1) fresh hemorrhage due to breaking down blood vessels with the instrument (2) signs of invagination in the glands, except in the basals where it is normal, and (3) certain necrotic changes which may in part be due to the method of fixation.

The preparation of the material is important since it is desirable to fix the tissues in a manner which will demonstrate the changes actually present at the time of removal both the epithelial and the stromal elements should be preserved. An ideal method for showing all the functions would be to fix the tissues in absolute alcohol, embed in paraffin, and stain with (1) Best's carmalum, (2) hematoxylin eosin, (3) van Gieson stain and (4) toluidine blue. The ideal stain for secretion should differentiate between secretory products ready to be expelled and those in the early stages of development.

The cyclic variations in the epithelial elements include the ordinarily recognized changes occurring during the menstrual cycle and, in addition, certain changes in individual cells have been recognized for instance the nucleus in a cell bulging with secretion may be displaced toward the lumen rather than the periphery of the gland—a condition which the author denotes as "secretion retention." Other cells are large with pale nuclei and apparently empty cell bodies which are jammed in between seemingly normal cells.

The stromal constituent should undergo cyclic alteration with the epithelial elements however in some instances the author observed no pregravid alteration of the stroma, although there was noted a well developed secretory glandular activity and in other cases the reverse was true. This is believed to be due to abnormal stimulation.

The author concludes that in every case the whole picture of what is happening to the endometrium cannot be evaluated even with good biopsy material.

J ROBERT WILLSON M.D.

Falconer B.: Investigations on the Uterine Mucosa. The Occurrence and Significance of Ecrotic and Cystic Glands in the Uterine Mucosa. *Acta obst. gyn. scand.* 1946, 26 475.

The author reviews the literature on abnormalities of the endometrium and concludes that occasional cystic or enlarged glands are merely physiologic variations. Enlarged and cystic glands are known to occur in association with endometrial hyperplasia, cystic glandular hyperplasia, endometritis atrophy myomas and in retrogressive hyperplasia.

Twenty cases of cystic enlargement of endometrial glands found in endometrial biopsy material from women still in the reproductive phase of life are discussed. The cases are divided into two groups of 10 each, in the first of which there was a known pathological condition as an explanation for the change. Included were 2 patients with myomas, 4 with cystic glandular hyperplasia, and 4 with hormonal deficiency. None of the second group could be classified as to the causes of cystic formation, but 5 patients were sterile and 5 had suffered habitual abortion. The author concluded that the presence of enlarged or cystic glands should suggest ovarian deficiency.

J ROBERT WILLSON M.D.

Falconer B.: Investigations on the Uterine Mucosa. On the Early Diagnosis of Metropathia Hemorrhagica. *Acta obst. gyn. scand.* 946, 26 535.

In an attempt to make a diagnosis of metropathia hemorrhagica cystica early in its course, the author suggests several changes in the endometrial glands and the stroma which occur with this condition.

The alterations in the glands are an abnormal increase in number and groups of closely packed glands which may show signs of invagination or which may be dilated and cystic. The cells may be cylindrical and contain elongated nuclei which are rich in chromatin. The stromal changes are areas of cellular hyperplasia in which the cells are spindle shaped and contain large numbers of connective tissue fibrils the blood and lymph vessels are dilated.

Six cases in which several endometrial biopsies were obtained are presented. In 4 of these the microscopic changes were noted at a time when there was no abnormal bleeding which however subsequently appeared.

J ROBERT WILLSON M.D.

Goerriero, W. F. Jennett, R., and Mantooth, W. B.: Infectious Granulomatous Lesions of the Cervix. *J Am M Ass.* 947 33 83.

The authors note that the group of infectious granulomas of the cervix include lesions resulting from tuberculosis, granuloma inguinale, syphilis, and chancre. Their importance depends on their morphological resemblance to carcinoma as seen at speculum

examination and in addition the symptoms of the granulomatous cervical lesions are basically those of carcinoma. Minor deviations of this are pointed out in the clinical course, therapy, psychologic effect on the patient, and the prognosis are vastly different from those in carcinoma.

Over a period of 3 years the authors observed 123 patients on whom biopsy of the cervix was done. Microscopic examination of the tissues revealed carcinoma in 34 (10.4%) cervicitis in 79 (64.6%) cervical polyp in 3 (2.5%), leucoplakia in 3 (2.5%), squamous metaplasia in 2 (1.6%), granuloma inguinale in 3 (2.5%), tuberculosis in 2 (1.6%), tertiary syphilis in 1 (0.8%) and chancroid in 1 (0.8%). In addition, 26 cases of primary and secondary syphilis, and 1 case of chancroid were found in the group of patients studied.

A discussion of tuberculosis of the cervix is presented. Clinically the diagnosis is seldom made although one must be suspicious of all granulomatous lesions of the cervix in patients with tuberculosis elsewhere. The treatment may be curative or palliative according to the parity and age of the patient, the location and extent of the lesion, and the number of distant foci. The operation may consist of cervical amputation or total hysterectomy.

The cervix is now recognized as a primary or secondary site of granuloma inguinale. When lesions are found in other locations than in the inguinal region it has been suggested that the entity be called "granuloma venereum." To avoid further confusion the authors suggest the term "granuloma venereum cervicitis."

Like tuberculosis, granuloma venereum cervicitis undoubtedly will be found, with correct diagnosis, to be a relatively common lesion particularly in the negro. The specific etiologic agent is a micro-organism the Donovan body which is probably a protozoan, has never been cultured, and is pathogenic only for man. The final diagnosis depends on a demonstration of the Donovan body in smears, scrapings or a biopsy specimen.

Therapy is general, local, and specific. General measures include adequate diet, vitamins and penicillin and sulfonamide compounds given parenterally. Local therapy in the form of sulfonamide jellies or sulfonamide powder is frequently of benefit. Specific therapy by the administration of one of the antimony compounds over a period of 6 months is advised.

This disease deserves special mention when it affects the pregnant patient. The therapeutic response is poor, infection is common and large growths may cause dystocia, hemorrhage and cervical and uterine tears. In some cases delivery by elective cesarean section with or without hysterectomy may be indicated.

Until recently syphilitic lesions of the cervix have been regarded as uncommon. In a large and carefully examined series of patients Davies reported an incidence of 44 per cent. Syphilis of the cervix may be primary, secondary or tertiary. The primary

stage is recognized by the chancre. The secondary stage appears either as an erosion, macule, papule, or ulcer. The tertiary lesion is an ulcerative or proliferative gumma and is the type most commonly confused with carcinoma.

The diagnosis of primary and secondary lesions depends on the finding of the *Spirochaeta pallida* by dark field examination, since serologic tests are not always positive until 3 weeks after the initial infection. The tertiary lesion is diagnosed by biopsy and positive serologic tests. Recognized antisyphilitic therapy is advocated for all syphilitic lesions of the cervix.

Chancroid of the external female genitalia is common but this type of cervical infection is rare. Chancroid or *ulcus molle cutis* is a highly infectious localized lesion caused by inoculation with the *Haemophilus* of Dancery, a gram-negative bacillus appearing singly or in short chains. Diagnosis is made by smear culture, Ito-Reensterna skin test and biopsy. The treatment consists of the administration of sulfathiazole parenterally and locally for from 7 to 10 days.

In conclusion, the authors note that infectious granulomatous lesions of the cervix are more common than has previously been suspected. The improvement of diagnostic facilities has made specific diagnosis of these lesions possible. When a clinical diagnosis of carcinoma of the cervix is not substantiated by microscopic examination, one of the granulomatous lesions should be suspected. The importance of specific diagnosis rests in the fact that the clinical course, therapy, psychologic effect on the patient, and the prognosis are vastly different from those for carcinoma. HAZARD F. THURSTON, M.D.

ADNEAL AND PERIUTERINE CONDITIONS

Cirio Malbrán Miguel Angeli: The Estrogenic Value of the Remaining Ovary (Valor estrogenico del ovario restante). *Obst. Gyn. Int. Amer.* 1946 4: 873.

In his study of the estrogenic power of the ovaries the author employed 44 white adult rats. First, the tubes and the uterus were removed then the remaining ovaries were implanted into other castrated rats. The function of the implanted organs was studied by examining vaginal smears of the recipient

Immediately following hysterosalpingectomy there is usually a hyperfunction of the ovaries followed by a stage of hypofunction. As a rule, the ovaries in the author's experiments were removed 160 to 180 days after hysterosalpingectomy to avoid the aforementioned fluctuations of ovarian function.

The experiments showed that the estrogenic power of ovaries remaining after removal of the tubes and the uterus is only about half as strong as that of control animals. Cyclic variations may be observed in ovarian tissue of various weight served to determine the minimum weight capable of induction of estrus in the recipient animals. Histologic studies of implant

ed ovaries disclosed the presence of normal ovarian tissue in cases in which estrus was produced. Failure of estrus to appear in the recipient coincided with involution of the implanted ovary which showed signs of atresia, hyperplasia of interstitial tissues, sclerotic changes, etc. The estrogenic effect of implanted ovaries depends on the functional condition of the ovarian tissue at the time of implantation. If the ovaries are removed during the premenstrual phase, estrus is more easily produced than in cases in which the ovaries are removed during the intermenstrual period.

All these results pertain to ovaries removed a long time after hysteroligectomy and the author stresses the fact that entirely different results may be obtained if the ovaries are removed shortly after excision of the uterus and the tubes. In all experiments, the ovaries were implanted subcutaneously in the dorsal region. JOSEPH K. NARAY, M.D.

Meleiro de Sousa, H.: Benign Tumors of the Ovary with Ascites and Hydrothorax—Meigs Syndrome (Tumores benignos do ovário com ascite hidrothorax. Síndrome de Meigs) *Rev. cli. (est. med.)*, 947, 7.

A 26 year old woman developed pain in the left lower quadrant of her abdomen accompanied by vomiting 5 months prior to admission to the hospital. Menstruation continued to be normal but nausea and vomiting recurred at frequent intervals, the abdomen continued to increase in size and the patient was losing weight.

The physical examination revealed a tumor in the left lower quadrant of the abdomen. It had a smooth surface and was mobile and slightly painful to touch. Ascites and right hydrothorax were also detected on clinical and roentgenographic examinations.

A clinical diagnosis of fibroma of the left ovary with pleural and peritoneal effusions was made and an operation was performed under spinal anesthesia. The tumor with the corresponding tube was removed and about 8 liters of yellowish fluid were aspirated from the peritoneal cavity. The fluid contained 13 per cent albumin and numerous lymphocytes. The Gram and Ziehl stain tests were negative. The tumor was surrounded by a fibrous capsule. The histologic examination established the diagnosis of pseudomucinous cystadenoma, partially papilliferous.

The patient made an uneventful recovery and on re-examination 2 years after the operation showed a gain in weight of 14 kgm.

Various factors have been accused of producing pleural and peritoneal effusions in such cases: (1) hypoproteinemia, (2) congenital communications between the pleura and peritoneum, (3) asymptomatic cardiopathy capable of sustaining circulation under normal circumstances but leading to decompensation when alterations of the pelvic circulation are present, (4) mechanical obstruction of the reflux of the venous blood to the thorax, and (5) the passage of peritoneal fluid to the pleural cavity through the transdiaphragmatic lymphatic system.

The author favors the theory of the origin of the fluid as the tumor itself. The lymphatic paths probably carry the fluid from the peritoneum to the pleural cavity. JOSEPH K. NARAY, M.D.

MISCELLANEOUS

Decker, A.: Posterior Colpotomy for the Diagnosis of Pelvic Diseases. *Am. J. Surg.* 1947 73 313.

The author notes that the vaginal route for the removal of pelvic organs and for the diagnosis of pelvic diseases has been little used in the past few decades. Prior to the advent of modern abdominal surgery, however, many pelvic surgeons considered this the approach of choice for the removal of the uterus and its appendages. Except for hysterectomy in selected cases and the rare removal of a tube in ectopic pregnancy, posterior colpotomy for pelvic surgery is now rarely employed. The literature of recent years dealing with posterior colpotomy is reviewed.

The author states that the purpose of this report is threefold. It is intended to emphasize the safety, simplicity and reliability of cul-de-sac puncture when it is performed in the knee chest position. Moreover, some of the details gained by experience thus far are related. The value of endoscopic visualization is demonstrated by case reports.

The technique for endoscopic visualization of the pelvic organs is presented in detail. Puncture of the posterior vaginal wall into the pelvic peritoneal cavity by means of a needle or trocar has been employed more than 400 times, in most instances for the purpose of endoscopic visualization of the pelvic viscera.

The cases selected for this observation presented clinical evidence before examination that varied from a normal pelvis or minimal amount of pelvic disease to large palpable tumor masses. Some were examined in the presence of extensive pathologic processes to determine the limitations of the diagnoses, which were sessile fibroma, right salpingitis, and endometriosis of the uterus, respectively.

The author is of the opinion that cul-de-sac puncture for diagnostic purposes is best employed in the knee chest position. When combined with endoscopy it is a useful adjunct to the present methods of diagnosis in obscure pelvic diseases. Cul-de-sac puncture cannot be performed through an intact hymen or when disease or atrophic conditions make the introitus and vagina inadequate. It should not be employed in the presence of acute vaginal infection or when the cul-de-sac is filled with a fixed mass that does not move out of the pouch when the patient assumes the knee chest position.

HENRY F. THURSTON, M.D.

Ercole, R.: Diverticula of the Female Urethra. Four Personal Observations (Diverticoli della uretra femminile. A proposito di 4 osservazioni personali) *Rev. argent. urol.* 945, 14 32.

Urethral diverticula occur with much greater frequency in men than in women because the course of

the urethra and the proximity of the prostatic gland in men facilitate the development of suppurative processes. In many instances diverticula in women are overlooked because urethrocystoscopy does not constitute a part of the routine examination. Therefore small diverticula may easily escape detection.

Diverticula in women may be divided into two groups: the congenital and the acquired. Those belonging to the first group may develop from Gaertner's duct, paraurethral ducts, residues of the Wolffian duct, and from vaginal cysts. Acquired diverticula usually are the result of an infection or trauma. Suppuration of a urethral gland which preserved its communication with the urethra may be responsible for the formation of a diverticulum. Instrumentation of the urethra or the passage of a stone may lay the basis for the formation of a diverticulum.

Urethral diverticula may be true or false. All layers of the urethra participate in the formation of a true diverticulum.

The most frequent symptoms of a diverticulum are pain, increased frequency and burning on urination. As a rule, an involuntary loss of a small amount of urine occupying the diverticulum follows voluntary micturition. Occasionally, as was the case in 1 of the author's patients, incontinence of urine may be present. Pressure on the anterior vaginal wall usually causes an escape of a small amount of purulent urine. Roentgenography of the urethra may reveal a diverticulum. Urethrocystoscopy with MacCarthy's panendoscope usually reveals the diverticulum.

The radical treatment consists of the extirpation of the diverticulum through an incision through the anterior vaginal wall. The defect in the urethra is closed with 3 interrupted catgut sutures and the vesicovaginal septum is closed as a separate layer. A retention catheter is introduced after the operation. Occasionally a complication in the form of a urethrovaginal fistula may develop shortly after the operation.

The author reports 4 cases of diverticulum. In 1 of them a calculus was found.

JOSEPH K. NARAT, M.D.

Sjbrall, A.: The Influence of Estrogen upon the Healing of Vaginal Wounds in Rats. *Acta obst. gynec. scand.* 1947 27: 1.

Previous experiments have demonstrated the beneficial effect of estrogenic preparations upon the healing of experimental skin wounds. This effect should be more marked in wounds of the female genital tract in which estrogen has been shown to induce hyperemia and epithelial proliferation.

The healing of experimental vaginal wounds in spayed female rats seems to be promoted by treatment with estrogen. Of 17 animals treated with subcutaneous injections of estradiol benzoate, 15 were healed in 5 days, whereas of 19 controls only 6 were healed during the same period.

These experiments tend to confirm the clinical usage of estrogen prior to operation for prolapse in elderly women.

GRACE BLONICK, M.D.

OBSTETRICS

PREGNANCY AND ITS COMPLICATIONS

Putignano, C.: Repeated Ectopic Pregnancies (Sulla gravidanza ectopica ripetuta). *Riv. ostet. gine.* 946, 1946.

The author reviews 27 cases of repeated ectopic pregnancies encountered in the Clinic of Obstetrics and Gynecology of the University of Bari in the period from 1925 to 1944. The ages of the patients ranged from 21 to 40 years, the highest incidence occurring among those between 31 and 35 years of age. Multiparous subjects represented over 77 per cent of the series. The site of implantation was the left tube in 56 per cent, and the ampulla was involved in 67 per cent of the cases. In a majority of the women an inflammatory process was determined, and the cause of the second ectopic pregnancy was the same as in the first.

Recommendations for management are conservative, surgery being restricted to the cases presenting an involved tube, unless specific findings indicate bilateral resection. The ovaries and uterus are preserved when possible, for maintenance of the endocrine balance.

EDITH B. FARNWORTH, M.D.

Chesterman J.: On the Treatment of Placenta Previa. *Med. J. Australia*, 947-949.

An analysis of the treatment of 115 patients with placenta previa who were admitted to the Women's Hospital Crown Street Sydney forms the basis of this article.

The more babies one saves in cases of placenta previa, the greater is the maternal mortality. The converse is also true—that by concentrating on the welfare of the mothers an undue number of the babies are lost.

TABLE I.—PLACENTA PREVIA SOME COMPARATIVE STATISTICS

Source	No. of cases	Maternal deaths		Fetal deaths	
		No.	Per cent	No.	Per cent
Eleven teaching hospitals in Great Britain (F. J. Brown)	1,793	123	5.9	1,650	54
Women's Hospital, Melbourne (1934 to 1944)	156	10	6.4	30	19
Royal Hospital for Women, Sydney (1913 to 1946)	130	1	0.8	29	22
Women's Hospital, Crown Street, Sydney (1935 to 1946)	111	9	8.1	23	21
C. H. Macfarlane (Belfast) (1917 to 1941)	181	—	2.2	43	24
Leonard Phillips (Queen Charlotte's Hospital) (1933 to 1946)	143	—	—	54	38
Josephine Barnes (University College Hospital) (1917 to 1941)	40	—	0	12	30

Placenta previa was classified as lateral if the placenta occupied in part the lower uterine segment marginal if it came to the edge of the internal os, and central if it completely covered the internal os at the onset of labor.

METHODS OF TREATMENT

Watchful expectancy. If active treatment to empty the uterus is started at the first hemorrhage, many premature or nonviable infants will be delivered with little chance of survival. To follow a method of watchful expectancy, it is absolutely essential for the patient to be in a well equipped hospital where active treatment can be given at a moment's notice. No vaginal examination should be made until a more serious hemorrhage or repeated hemorrhages make it imperative. In those cases in which the fetus is reasonably mature, either dead or alive, there is no need for this delay.

Hemorrhage from a laterally situated placenta previa is often controlled by the onset of labor and no further treatment is necessary.

Active methods of treatment

- Artificial rupture of the membranes
- The application of Willett's scalp traction for cephs, to which a weight is attached
- The use of a vaginal pack (alone, or followed by another procedure when the os is sufficiently dilated)
- Compression of the placenta by the half breech
- The introduction of a hydrostatic bag
- Cesarean section

The fetal mortality rate among those capable of surviving is 42 per cent. The best results were obtained when lateral placenta previa was present (38% of fetal deaths), and the next best when the placenta was centrally placed (57%) because of the higher incidence of treatment by cesarean section. The highest mortality rate occurred when the marginal variety of placenta was present.

ANALYSIS OF TREATMENT

In 56 cases of central placenta previa, 88 cases of marginal placenta previa, and 8 cases of lateral placenta previa, the hydrostatic bag was not used at all.

No special treatment was employed in 49 cases, with fetal death in 22.

If the patient is in labor hemorrhage is still occurring, and the placenta is not lying centrally artificial rupture of the membranes is often all that is necessary. This was employed in 19 cases with 9 fetal deaths.

Willett's forceps were applied to the scalp in 33 cases with 21 fetal deaths (65%).

Summing up these three relatively simple methods of treatment, we find that they were employed in 100 cases with the same fetal mortality rate as the average for the whole series. They were used in 4 cases

of central placenta previa with no live babies. The high fetal death rate in the 47 cases of marginal placenta previa (about 70%) suggests that in some of them at least other methods of treatment might have given better fetal results without increasing the maternal risk too much.

The group of patients (47) treated by plugging with the half breech included all those in whom a fetal leg was pulled down to control hemorrhage. The fetal mortality rate was extremely high (91%).

The author believes that some of these patients might have been treated better by cesarean section. The author gives the best result for the baby and in this series it was safe for the mother. To reach the consensus of opinion has been swinging steadily in favor of cesarean section.

The large majority of these patients are multiparas, and consequently a scar in the uterus is of less importance than it would be in a primigravida. In such cases, with free use of blood transfusion and chemotherapy, the risk of cesarean section to the mother may be less than the risk of vaginal section. The shock, blood loss, and risk of infection are unavoidable in penetrating the placenta to pull down a leg can be great. The operation was performed in 70 cases with 18 fetal deaths. The classical operation was used in practically every case. The author prefers a combination of local anesthetic infiltration of the abdominal wall down to and including the incision of the peritoneum and pentothal sodium.

DANIEL G. MORROW, M.D.

Henderson D. N. The Obstetric Management of Pregnancy Complicated by Heart Disease. *Am J Obst* 1947 53 494.

The author reviews 200 cases of pregnancy complicated by heart disease: 100 by rheumatic heart disease, 7 by congenital heart disease, and 3 by degenerative heart disease.

Some of the cases were under a special management plan and these were divided into three groups according to the severity of the disease. The patients reported for examination every 3 weeks, and were seen by the cardiologist every 4 weeks. All patients were advised to rest a minimum of 12 hours daily and this was increased as the pregnancy progressed or the exercise tolerance diminished. If adequate rest could not be obtained at home, the patient was sent to the hospital. Most patients in Group II, with moderate to severe impairment of exercise tolerance, were advised to come into the hospital for confinement. Patients were warned of the seriousness of upper respiratory infection and advised to take more than usual care if such infection occurred. When possible, the normal weight gain was limited by suitable diet to 15 pounds. If the patient was obese, an effort was made to prevent any gain in weight. The development of signs of the late toxemias of pregnancy was considered serious, and immediate admission to the hospital was recommended for even mild degrees of albuminuria and hypertension.

Thirty patients had their pregnancies terminated because of heart disease, and 170 reached the period of viability. In 40 of these the onset of labor was premature, and this resulted in a fetal mortality of 17 per cent. The maternal mortality rate for the whole group was 4 per cent and for the patients under control of the management plan 2 per cent. The average age at death in the whole series was 38.8 years, 1 year less than the average age at death of 56 consecutive female patients proved at autopsy to have died from rheumatic heart disease not associated with pregnancy.

During recent years heart disease has not been considered an indication for cesarean section. One hundred and twenty-eight consecutive women with heart disease have been delivered vaginally. Cesarean section has been necessary on only 3 occasions and was performed only for obstetric indications.

JOHN R. WOLFF, M.D.

De Giorgi L.: Cancer of the Lung in Pregnancy. (*Il cancro del polmone in gravidanza*) *Arch ital gin* 1946, 51 330.

A 45 year old woman in the initial period of her eighth pregnancy suffered a sudden hemoptysis, emaciation. Pleuritic attacks a year previously had led to a diagnosis of pulmonary tuberculosis. The roentgenologic examination disclosed extensive cavitation of the left lung and evidence of nodule formation in the right lung. Pneumothorax on the left led to partial collapse of the left upper lobe. The lower lobe remaining densely shadowed and immobile. Premature labor at the seventh month of the pregnancy resulted in the birth of an immature child which died 3 hours after birth. Following the labor the general condition of the already precariously ill patient became worse, there was rapid accentuation of the respiratory difficulty and death 2 weeks later.

Autopsy uncovered an extensively adherent infiltrated and cavitated left lung and similar condition on the right side. The infiltration proved to be of a carcinomatous character involving the bronchi, blood vessels and lymph glands diffusely. Similar histologic characteristics were noted in a nodule in the left breast, the thyroid, left suprarenal gland, hypophysis, and right ovary. The extensive nature of the pulmonary lesion and the polymorphous character of the invading cancer cells—so characteristic of bronchial carcinoma—and the history of pleuritic manifestations suggested primary pulmonary carcinoma with secondary metastasis to the other organs.

The two remarkable and instructive facts with reference to the effects of pregnancy on the growth and metastases in this case were the apparent accelerative effect of the pregnant state on the growth of the tumor and the apparently elective character of the metastases. The author does not try to decide if the dissemination of these metastatic processes can be explained on the basis of the increased blood supply to the endocrine organs during preg-

nancy or whether a peculiar predisposition of the cellular substrate of the involved organs is involved. In any event, the author thinks that his case strikingly illustrates the difference between the theory of clinicians, who are rather unanimous in asserting that pregnancy has a deleterious influence on the growth and metastases of neoplasms, and that of experimental researchers, who tend to show that the hormones predominant in the process of pregnancy (prolan) have an inhibitory effect on certain types of new growths.

JOHN W. BREKIDAN, M.D.

Falconer, B.: A Study of the Pathology of Habitual Abortion. *Acta obst. gynaec. scand.* 94b, 26 496.

The present report concerns 33 cases classified as habitual abortion. In each case an attempt was made (on the basis of history, physical findings, semen examination, and endometrial biopsy) to establish the etiology. Four of the cases were discarded because each patient had had normal deliveries between several abortions.

Of the remaining 29 cases, the author concludes that in 4 patients the etiology of the miscarriages was on the basis of previous pelvic surgery or infection. In 3 there were physical abnormalities of the pelvic organs. In 3 patients abnormal semen was responsible and 4 patients were found to have an abnormal endometrium.

In the last of the groups there were cystic glandular hyperplasia in 1 case, tuberculosis in 1 case, and dilated cystic glands in 3 cases indicating ovarian deficiency.

J. ROBERT WILLSON, M.D.

LABOR AND ITS COMPLICATIONS

Rohlee, M. A.: Morbidity Associated with the Induction of Labor. *Am. J. Obst.*, 947 53 38.

Does the induction of labor increase maternal morbidity? Five hundred cases in which labor was induced by medical and mechanical means are reviewed and it was found that a marked increase in morbidity may result from such methods.

This increase in morbidity is caused by forcing labor before the cervix, lower uterine segment and uterus have been prepared for labor. The author believes that induction of labor after spontaneous rupture of the membranes may be a dangerous procedure. For the management of contracted pelvis, pelvic disproportion, and postmaturity induction has little or no usage.

Elective induction of labor which would have occurred in from 24 to 48 hours later gives little or no morbidity. Such elective induction is of little or no obstetric advantage but rather has convenience and order as its justification. The morbidity incurred by induction of labor must be evaluated against any questionable advantages of such management. This means that induction of labor merits obstetric usage mainly in the management of the toxemic patient, including the diabetic. The character and results of induced labor approach those of natural spontaneous labor only when the induced labor precedes by 48 hours, or less, the time when spontaneous labor would have occurred anyway.

JOHN R. WOURT, M.D.

Odeh, L. D., Randall, J. H., and Scott, G. W.: Prolonged Labor. *J. Am. M. Ass.*, 947 33 735.

In a series of 25,824 deliveries the authors found prolonged labor in 3.7 per cent. 66.9 per cent of the patients were primigravidae, 29.3 per cent had operative delivery, and 25.5 per cent had a febrile postpartum course. The maternal mortality rate was 0.7 per cent and the infant mortality rate was 10.4 per cent (largely due to intracranial hemorrhage). The maternal deaths were all attributed to puerperal infection.

The majority of these patients had uterine inertia rather than pelvic disproportion or abnormal presentation. Whereas no conclusions are derived in relation to the etiology of inertia, it is suggested that an abnormality of innervation or failure of the proper muscular response is the underlying mechanism. Furthermore, certain emotional disturbances may well play a role in this disturbance.

The authors believe that two separate courses are responsible for the control of blood loss following the separation and delivery of the placenta. The first is retraction, which occurs in the innermost muscular layers just beneath the decidua. The second is contraction of the remaining uterine muscle, which causes intermittent ischemia and thus stimulates thrombosis. The most interesting observation was that in this group postpartum hemorrhage occurred in 7.6 per cent as against 4.3 per cent in the so-called normal labors. Further it was found that in the patients who had had operative delivery the incidence rose to 10.5 per cent but fell to 6.4 per cent in the spontaneous deliveries. Therefore a conservative attitude in the management of prolonged labor with a particularly careful conduct of the third stage of labor is recommended.

JAMES F. DONOFRAY, M.D.

GENITOURINARY SURGERY

ADRENAL, KIDNEY AND URETER

Mathé, G. P.: Unilateral Renal Tuberculosis. *J Urol* Balt., 1947 57 451

The author describes the management of the nephrectomized patient

The author reviews 98 cases of renal tuberculosis to emphasize the importance of periodic postoperative cystoscopic examinations with the view of reducing the mortality and increasing the number of permanent cures. He suggests that the type of nephrectomy depends on the extent of the pathological process. If the ureter is involved a nephroureterectomy is done either primarily or the ureter is removed later if it is uninvolved simple nephrectomy is done. In critically ill patients complicated by perinephric abscess incision and drainage of the abscesses may be followed in 2 weeks by nephrectomy. The author lavages his wound with saline solution and then introduces from 2 to 4 gm. of sulfa drugs and 100,000 units of penicillin in 100 c.c. of saline solution which he believes is definitely helpful in preventing break down of wounds.

Following nephrectomy there is often persistence of tuberculous cystitis which necessitates long term cystoscopic treatment of ulcers and stricture of the intramural segment of the ureter. In this series stricture of the opposite ureter was found in 28 patients it was treated by dilatation. Intractable cystitis is characterized by sclerowing cystitis and ulcer formation. This condition was so intolerable in 4 instances that diversion of the urinary stream was necessary.

Analysis of the 98 cases reviewed revealed the following:

1. Tuberculosis of the kidney occurs less frequently in the western part of the United States than elsewhere.

2. Stone occurred in 7 cases with renal tuberculosis, in 3 with cancer and in 3 with renal hypertension.

3. The mortality rate in 81 cases following nephrectomy for unilateral tuberculosis was 1.2 per cent.

4. Twenty-eight of the 81 patients operated upon had ureteral stricture which emphasizes the importance of postoperative observation and treatment.

ROBERT O. BEADLER, M.D.

Bondy P. K., and Barnwell C. H. Chronic Typhoid Pyonephrosis. *J Urol* Balt., 1947 57 742.

The problem of the management of the chronic urinary typhoid carrier seldom confronts American physicians today. This is partly because of the recent great reduction in the incidence of typhoid fever in the United States and partly because the renal carrier state occurs only rarely after acute typhoid

fever. If surgical treatment can eliminate the source of the organisms in such a case without harm to the patient the major objective of the control of typhoid carriers will be achieved.

The authors present a case of chronic typhoid pyonephrosis of long standing in which the urinary carrier state was cured by surgical extirpation of the involved kidney. The patient, a 32 year old soldier had had typhoid fever at the age of 12 years. He had had no urinary symptoms until 4 years before admission when nocturia became noticeable. Urinalysis revealed innumerable white blood cells and a slight trace of albumin and a culture yielded the *Eberthella typhosa*. Urologic study revealed the disease to be confined to the right kidney which presented the picture of pyonephrosis with a stone impacted in the ureteropelvic junction. A right nephrectomy was done and the convalescence was uneventful. Repeated urine cultures were negative.

Pyonephrosis as a complication of typhoid fever is not a common occurrence. The reported cases can conveniently be divided into 3 groups: those occurring during the acute, initial attack of typhoid fever; those occurring as a result of superimposed typhoid infection upon a previously occurring renal disease; and those which because of their chronic character their lack of symptoms and their persistent bacilluria, constitute the silent carrier group. In the series which the authors collected from the literature 7 of 12 in the first two groups died. However all those in the asymptomatic carrier group recovered after nephrectomy.

Although the authors' patient had been a carrier for 20 years, not a single secondary case had been produced, either within his family or among his close associates.

JOSEPH E. MAURER, M.D.

Harvey N. A.: Renal Tumors. *J Urol* Balt., 1947 57 669

In the opinion of the author the theory of Grawitz is untenable as an explanation of the histogenesis of renal cortical malignancies. The early literature is reviewed, and the author presents clinical and pathological data on 50 renal tumors and 8 incidental "hypernephroid" tumors found in the course of 4,520 autopsies and 39,857 surgical operations at the Rhode Island Hospital, Providence from 1929 through 1944. Thirty nine of the tumors were surgical specimens while the remaining 19 were removed at autopsy. It is pointed out that renal tumors constitute about 2 per cent of all tumors in adults and about 20 per cent of those in children. In this series there was a 66 per cent incidence of cortical adenocarcinoma, a 26 per cent incidence of carcinoma of the pelvis (including 1 case of epidermoid carcinoma) and a 6 per cent incidence of Wilms tumor, 2 per cent of the cases eluded classification. Seventy per cent of the cases were in males.

nancy or whether a peculiar predisposition of the cellular substrate of the involved organs is involved. In any event, the author thinks that his case strikingly illustrates the difference between the theory of clinicians, who are rather unanimous in asserting that pregnancy has a deleterious influence on the growth and metastases of neoplasms and that of experimental researchers, who tend to show that the hormones predominant in the process of pregnancy (prolan) have an inhibitory effect on certain types of new growths.

JOHN W. BENDIXEN, M.D.

Falconer, B.: A Study of the Pathology of Habitual Abortion. *Acta Obst. Gyn. Scand.* 946, 26 496

The present report concerns 33 cases classified as habitual abortion. In each case an attempt was made (on the basis of history, physical findings, semen examination and endometrial biopsy) to establish the etiology. Four of the cases were discarded because each patient had had normal deliveries between several abortions.

Of the remaining 29 cases, the author concludes that in 4 patients the etiology of the miscarriages was on the basis of previous pelvic surgery or infection. In 3 there were physical abnormalities of the pelvic organs. In 3 patients abnormal semen was responsible, and 4 patients were found to have an abnormal endometrium.

In the last of the groups there were cystic glandular hyperplasia in 1 case, tuberculosis in 1 case, and dilated cystic glands in 2 cases indicating ovarian deficiency.

J. ROBERT WILLSON, M.D.

LABOR AND ITS COMPLICATIONS

Roblee, M. A. Morbidity Associated with the Induction of Labor. *Am. J. Obst.* 947 55 38

Does the induction of labor increase maternal morbidity? Five hundred cases in which labor was induced by medical and mechanical means are reviewed and it was found that a marked increase in morbidity may result from such methods.

This increase in morbidity is caused by forcing labor before the cervix, lower uterine segment, and uterus have been prepared for labor. The author believes that induction of labor after spontaneous rupture of the membranes may be a dangerous procedure. For the management of contracted pelvis, pelvic disproportion, and postmaturity induction has little or no usage.

Elective induction of labor which would have occurred in from 24 to 48 hours later gives little or no morbidity. Such elective induction is of little or no obstetric advantage, but rather has convenience and order as its justification. The morbidity incurred by induction of labor must be evaluated against any questionable advantages of such management. This means that induction of labor merits obstetric usage mainly in the management of the toxemic patient, including the diabetic. The character and results of induced labor approach those of natural spontaneous labor only when the induced labor precedes by 48 hours, or less, the time when spontaneous labor would have occurred anyway.

JOHN R. WOLFE, M.D.

Odell, L. D., Randall, J. H., and Scott, G. W.: Prolonged Labor. *J. Am. M. Ass.* 947 33 735

In a series of 15,824 deliveries the authors found prolonged labor in 7 per cent. 66 per cent of the patients were primigravidae, 49.3 per cent had operative delivery, and 25.5 per cent had a febrile postpartum course. The maternal mortality rate was 0.7 per cent and the infant mortality rate was 10.4 per cent (largely due to intracranial hemorrhage). The maternal deaths were all attributed to puerperal infection.

The majority of these patients had uterine inertia rather than pelvic disproportion or abnormal presentation. Whereas no conclusions are derived in relation to the etiology of inertia, it is suggested that an abnormality of innervation or failure of the proper muscular response is the underlying mechanism. Furthermore, certain emotional disturbances may well play a role in this disturbance.

The authors believe that two separate courses are responsible for the control of blood loss following the separation and delivery of the placenta. The first is retraction, which occurs in the innermost muscular layers just beneath the decidua. The second is contraction of the remaining uterine muscle, which causes intermittent ischemia and thus stimulates thrombosis. The most interesting observation was that in this group postpartum hemorrhage occurred in 7.6 per cent as against 4.3 per cent in the so-called normal labors. Further, it was found that in the patients who had had operative delivery the incidence rose to 10.5 per cent but fell to 6.4 per cent in the spontaneous deliveries. Therefore a conservative attitude in the management of prolonged labor with a particularly careful conduct of the third stage of labor is recommended.

JAMES F. DOUGLASS, M.D.

GENITOURINARY SURGERY

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ROBERT O. BRADLEY, M.D.

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The authors present a case of chronic typhoid pyonephrosis of long standing in which the urinary carrier state was cured by surgical extirpation of the involved kidney. The patient, a 32 year old soldier had had typhoid fever at the age of 12 years. He had had no urinary symptoms until 4 years before admission when nocturia became noticeable. Urinalysis revealed innumerable white blood cells and a slight trace of albumin and a culture yielded the *Eberthella typhosa*. Urologic study revealed the disease to be confined to the right kidney which presented the picture of pyonephrosis with a stone impacted in the ureteropelvic junction. A right nephrectomy was done and the convalescence was uneventful. Repeated urine cultures were negative.

Pyonephrosis as a complication of typhoid fever is not a common occurrence. The reported cases can conveniently be divided into 3 groups: those occurring during the acute initial attack of typhoid fever; those occurring as a result of superimposed typhoid infection upon a previously occurring renal disease; and those which, because of their chronic character their lack of symptoms and their persistent bacilluria, constitute the silent carrier group. In the series which the authors collected from the literature, 7 of 12 in the first two groups died. However all those in the asymptomatic carrier group recovered after nephrectomy.

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JOSEPH E. MARSH, M.D.

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The "classic" triad of hematuria, pain, and a mass was found in 17 per cent of the cases. Microscopic urine studies in 44 cases revealed red cells in 7 per cent whereas the incidence of gross hematuria in the whole series was 59 per cent. Proteinuria was the most frequent urinary finding and occurred in 93 per cent of the cases. Hematuria was the most common initial or early symptom in the operable cases while metastatic symptoms were the most frequent early features of the inoperable series. Pain was classified as primary when limited to the back or flank, and as secondary when it was due to metastases. The presence of a mass is usually a late symptom. Typically the mass is located in the flank, it is firm, smooth, rounded, moves freely with respiration, and is not particularly tender.

Urinary symptoms were present in 40 per cent of the operative cases and consisted of dysuria followed by frequency, urgency, pain, and burning, in that order.

The value of intravenous pyelography as a means of diagnosis is stressed.

Metastatic lesions appeared in the following order of frequency in the lungs, bones, liver, lymph nodes, renal veins, suprarenals, opposite kidney, pleura, central nervous system, and pancreas. More than 50 per cent of the metastatic lesions occurred in the lungs. Tumor embolism is believed to be the most common mechanism of spread and is substantiated by the high incidence of pulmonary lesions.

Immediate surgery without irradiation is considered the therapeutic procedure of choice, and mention is made of the fact that the surgical mortality in fixed tumors is sufficiently high to warrant discontinuance of the operative procedure in cases in which the situation is fixed. In such cases irradiation may afford a prolongation of life, as relief in pain. It is pointed out that immediate postoperative irradiation deserves serious consideration, since in terms of five-year survival, the percentage was 42 per cent as compared to 31 per cent in cases in which irradiation preceded surgery.

lively the third child died from pertussis complicated by pneumonia, and the fourth died from uremia one year following the operation. The last child had lost a solitary kidney.

The author describes the preoperative and post-operative routines in detail and briefly discusses his operative method, which is a modification of the Coffey I technique.

It is suggested that the operation be performed during the first year of life rather than later since infants stand the operation infinitely better and there is less renal damage present at that time. The technical difficulty associated with the presence of smaller structures is not considered a contraindication. The ectrophic bladder is removed at this time while plastic procedures on the penis are delayed until the child is 5 or 6 years of age.

This article clearly presents a sound logical reasoning to support the author's conclusions and the material is presented in a concise, factual manner.

ROBERT LACH, JR., M.D.

BLADDER, URETHRA, AND PENIS

Moskale, U.: Telangiectatic Granulations of the Urinary Bladder following Radiotherapy for Cancer of the Uterus (Les granulations télangiectatiques capillaires de la vessie à la suite de la radiothérapie pour cancer de l'utérus). *J. seral. med.*, Paris, 1946, p. 33-3.

Early and late lesions can occur in the urinary bladder following radium therapy and roentgen therapy for cancer of the uterus, especially if there have been errors in technique or if the dosage has been very high.

The early reactions appear during treatment and are represented by the common but harmless catarrhal cystitis which rapidly disappears and seldom leaves radionecrotic ulcers. One can also notice extravasations of blood and a hyperemia of the trigone 2 or 3 weeks after completion of radiotherapy. These were classified by Korchow as erythema of radiation.

The late reactions are less common, usually occur from 2 to 4 years after radiotherapy, and are classified as reversible and irreversible.

The irreversible lesions, thoroughly characterized by atrophy of the bladder and by extensive alterations of the veins and arteries, are permanent.

The reversible lesions caused by hypotrophic technique are the radionecrotic ulcers, which erode the bladder wall to such a degree that severe hemorrhages or fistulas may develop.

In addition, radionecrotic ulcers, tiny but numerous, have been observed on the mucosa. These were called "humbeartige Tubercles" by Schneider and "humbeartige Tubercles" by Veil.

The author has had the opportunity of examining 10 patients with lesions called telangiectatic lesions because of their gross appearance and their shape structure. They became the subject of his study.

The 10 women observed were referred to the author by the Radium Institute of Bologna where they had been treated for cancer of the uterus. The passage of a few drops of blood at the end of micturition associated with some urinary disturbance made the referring radiotherapist believe that either the cancer had directly invaded the bladder or metastases had occurred. Following discovery of the lesions each patient was closely observed and repeated cystoscopic examinations with biopsy were performed until the lesions disappeared.

The oldest patient was 70 years old and the youngest was 36 years old. The average age of the patients was about 60 years. Of these patients 9 presented an epithelioma of the cervix and 1 an epithelioma of the fundus. Nine patients were treated with radium and roentgen rays. In 1 case direct x ray therapy by intracavitary contact was substituted for radium. For routine treatment radium was applied into the vaginal cul de sac by means of 2 tubes of 10 mgm each, a filter of 2 mm. of platinum was used. In the uterine cavity tubes of 10 mgm. of radium single or also used at times. In the last type of treatment the filtration was 1 mm. of platinum or half that used in the vaginal cul de sac.

Early reactions occurred in 3 of the 10 patients and were represented by rectal tenesmus and cutaneous epitheliolysis. Only 1 patient developed cystitis while under treatment. The time of appearance of the granulations was between 17 and 44 months after completion of the treatment. The symptoms responsible for bladder investigation were pain usually at the end of micturition and hematuria which always was terminal.

In 6 cases the urinalysis was negative while in 4 cases microscopic hematuria and pyuria of no significance were recorded. Cystoscopy revealed a diffuse cystitis in 3 cases and typical radionecrotic ulcers in the other cases. The bladder capacity was within normal limits except in the 3 cases of cystitis. Subsequent cystoscopies as well as clinical follow ups of the patients have shown that the urinary symptoms and most of the granulations disappear within 3 months. The radionecrotic ulcers healed in approximately the same period of time. Following disappearance of the lesions the mucosa of the bladder appeared pale and atrophic and was often the seat of venous ectasias.

The author then described the pathology of the lesions. Grossly the granulations were prominent, rounded granular hnds sometimes composed of very other. Their bright red color contrasted with the pale and atrophic mucosa. They were comparable in size to a pinhead or flax seed but, as a rule they were of uniform size and very often occurred in groups sometimes quite numerous. They did not fade in the distended bladder but as seen in 7 cases a hematic subepithelial suffusion took place.

The granulations were usually found in the floor of the bladder beyond the interureteral ligament. They

were never observed to occur in the apex nor in the lateral walls of the bladder. Redness and edema of the diffuse cystitis type were sometimes associated with these lesions. In 3 patients the granulations surrounded the typical radionecrotic ulcers.

Microscopically these granulations were covered by an almost normal vesical epithelium which had the tendency to undergo metaplasia and so form the oecia of Limbeck and other arrangement of cells having somewhat the appearance of tubular glands.

These formations were described by Limbeck in 1887 and successively by von Brunn, Lendorf and others. They were thought to consist of epithelial nodules detached from the submucosa of the kidney pelvis the ureters and the bladder. Markwald Badke Barbacci Simelew thought them to be congenital. Today it is the opinion of Aschoff, Del Busco, Dionisi Pepere and Businco that they are due to a chronic inflammatory process or a chronic irritation of the mucosa. Following such irritation the epithelial bands and isolates them, and thus the nodules of Limbeck are formed. These were never observed in young patients.

If the stimulation continues and if the conditions of nutrition remain favorable the nodules of Limbeck may progress further. The central cells degenerate and the cells forming the wall of the cavity become transformed into a secretory epithelium forming cysts. Such would be the origin of the cystic cystitis. Furthermore according to Businco the formation of glands (glandular cystitis) and even of adenomas and adenocarcinoma of the urinary tract may follow by successive steps.

The loose connective tissue of the submucosa in which can be seen a more or less distinct infiltration of round cells discloses the presence of numerous tortuous and extremely dilated capillaries which give the tissue an angiomatous appearance. A few of these vessels extend to the basal membrane of the epithelium, which explains the bright color of the granulations. Sometimes a hematic suffusion is surrounded by a few of these vessels. The endothelium of the capillaries has normal characteristics. In 1 instance the author observed the presence of thrombi in the lumens. Numerous leucocytes were also seen in the capillaries because of stagnation of the circulation in such distended vessels.

At this point it was noted that the dilatation of the capillaries really exceeded the degree of vasodilation observed in pure inflammation and actually reached the stage of telangiectasias. The small thrombi in the ectatic capillaries may indicate a transitional stage toward the disappearance of these formations.

When the findings are such as described there is no difficulty in making the diagnosis. These formations have a great similarity to the ruby spots of the skin. As a rule the inexperienced endoscopist, confronted with such a picture suspects a neoplastic invasion or metastasis. Such suspicion first suggested by the history of a cancerous lesion is further substantiated

when the histologic examination reveals the nodules of Lillbeck which may simulate neoplastic buds. However, the picture of the neoplastic infiltration of the bladder is well defined. In most cases one can observe a solid salient mass surrounded by a bullous edema and very often characterized by the presence of ulcerations varying in depth, with irregular bases and with a definite tendency to bleed. In contrast to these are the radionecrotic ulcers which occur in an almost normal mucosa. They are characterized by regular edges and a clean base, and they very seldom bleed. They are not surrounded by the bullous edema but by telangiectatic granulations. These lesions must be differentiated from purpura of the bladder, hemorrhagic cystitis, and submucosal suffusions of blood produced by intravesical maneuvers.

Purpura of the bladder varies from the telangiectatic granulations because its spots are of various sizes and are flat and red or dark blue. The presence of a cutaneous purpura confirms the diagnosis.

Submucosal suffusions of blood due to endoscopic maneuvers appear as flat spots with irregular outlines which change during observation.

Therapy is exclusively symptomatic and consists of preventing and treating the cystitis. After the diagnosis of telangiectatic granulations has been established, urinary antiseptics should be prescribed. Depending upon the presence or absence of dysuria, morphine is indicated. One must avoid excessive distention of the bladder in order to prevent rupture of the capillaries with ensuing hemorrhage. Should hemorrhage occur, electric coagulation of the bleeding points should be contemplated.

The etiology of these granulations is problematic. Are they the result of a common inflammatory process or do they represent a reaction of the bladder to radiotherapy? Several factors confirm the latter theory. First such granulations have been observed in some women who have been treated with radium therapy for cancer of the uterus and have developed radionecrotic ulcers associated with these granulations in the expected period of time. Second, such formations have appeared exclusively in patients subjected to heavy dosage of therapy however with out over-treatment. Finally the capillary granulations occur only in that area of the bladder mostly exposed to the action of the rays. Furthermore, the histologic structure of the granulations forces one to associate these lesions with those produced by the action of radiotherapy on vessels.

On the basis of the infiltration of the round cells, can such a clinical picture be a chronic cystitis in which the capillaries dilate and proliferate? The macroscopic as well as the microscopic aspects of the lesions justify such therapy. The cystitis and the pyuria observed in 3 cases by the author must be considered as co-existent findings, the development of which is perhaps enhanced by these granulations. These lesions are then the result of the irritation produced by radiotherapy.

What rays, radium or roentgen, can be regarded as the responsible irritating agent? Several authors

(Schroeder von Ottow Neef) point out that the late lesions following roentgen therapy appear as a rule in the apex of the bladder while radium exerts its action on the floor of the bladder because the radium tubes deposited in the vaginal cul de sacs and the uterine cavity are closer to the floor than to the other area of the bladder. All the cases reported by the author were subjected to both types of therapy roentgen and radium.

It is not possible, then, to determine if these telangiectatic granulations can be attributed to the action either of radium therapy or roentgen therapy. Nevertheless, one must consider that several patients treated at the Bologna Institute of Radium with heavy doses of roentgen therapy have never developed, even years after the completion of the treatment, urinary symptoms or lesions of the bladder similar to the ones just reported by the author. It is more convincing to remember that these lesions are due to the combined action of both types of irradiation. The author concludes that these telangiectatic granulations do not justify any change in dosage of irradiation because the cure of the patient constitutes the principal goal of such therapy.

GERARD GARNOW, M.D.

Alvarez Zamora, R.: Sarcoma of the Bladder (Sarcoma de vejiga). *Arch. esp. urol.*, 947 3 7

Alvarez Zamora reports 4 cases of sarcoma of the bladder. The first occurred in a 72 year old male who had frequent hematuria and signs of urinary retention for 3 weeks before admission. On rectal palpation an irregular hard mass could be felt above the prostate. Infiltrating the right posterior wall of the bladder which by cystoscopy appeared to be a submucous tumor with almost complete integrity of the mucosa. A biopsy of the tumor revealed this to be a fibromyxosarcoma.

The second case, that of a 56 year old man with hematuria for 15 years which was previously diagnosed as a vesical polyp was treated by 5 consecutive electrocoagulations without any improvement. Cystoscopy disclosed a tumor of the bladder which histologically appeared to be a sarcoma of polymorphic cells combined with an epithelioma and a papilloma.

The third case that of a 56 year old man, presented polycythemia as the main symptom. At cystoscopy the condition appeared to be a submucous tumor. A subtotal cystectomy with bilateral iliac ureterostomy was performed. Histologically the tumor proved to be a fibrosarcoma.

The fourth case, that of a 32 year old man, presented a history of hematuria and polycythemia for 3 weeks. At cystoscopy a smooth, red, pediculated tumor about the size of a nut was found at the trigonum. This was resected with the electrocautery through an abdominal operation. Radium needles were placed *in situ* for 10 days. Histopathologically it proved to be a lymphocytoblastoma. The patient has been seen without recurrence after 2 years.

WILLIAM E. ROBERTS, M.D.

Kirz, E.: Ostitis Pubis after Suprapubic Operations on the Bladder *Brit J Surg.*, 1947 34 272

Ostitis pubis after suprapubic operations on the bladder appears to be a clinical entity. In a series of 174 patients the incidence of ostitis pubis was 3 per cent.

Three to 6 weeks after operation the patient complains of pain in the region of the symphysis pubis. This pain may extend toward the perineum and radiate down the inner side of one or both thighs. If the man is still in bed the slightest movement of the thighs or attempts to turn over or to sit up will cause pain. If he is up walking is difficult or impossible. In other cases standing may be easier than sitting the latter causing unbearable pain over the tubera ischii. Urinary symptoms are rare, but terminal dysuria occurs in cases in which the origin of the perineal muscles is involved similarly there may be pain on defecation. These symptoms may actually cause the patient to take to his bed again because only full rest will relieve them.

On examination the areas mentioned are extremely tender to touch. All active and passive movements of muscles originating from that part of the pelvis which is involved by the ostitis are limited and very painful. These muscles are at first spastic later in severe cases they may show great wasting. At times there may be some discharge of urine or pus from the lower part of the operation scar but no pathogenic organisms are obtained in culture. This discharge moreover does not seem an essential part of the trouble as it often occurs in cases showing no signs of ostitis pubis. Slight fever at the onset of symptoms is, however a characteristic feature. After major operations this area is usually the medial portion of the lower third of one or both corpora pubis. After minor operations fraying appears first at the upper corners of the pubic bone and in mild cases, the condition may be arrested at this stage. Most of the established cases, however later on show a definite spread involving variable amounts of pubic bone and ischium. The symphyseal cartilage may be absorbed giving the appearance of separation of the symphysis, and finally bony ankylosis may result. The formation of a sequestrum is the exception rather than the rule but areas of osteoporosis and osteosclerosis are seen later. Various explanations have been offered as to the pathogenesis. Two main factors appear to be essential in the production of the infection (1) leakage of infected urine into the retropublic space and (2) trauma both during and after operation.

The author advocates a method of operation to minimize this complication. The separation of the recti and pyramidalis muscles is carried out in the usual manner. Then about 3 cm. above the level of the symphysis a transverse incision 2 inches long is made through the anterior and posterior layer of the (continuation of the) transversalis fascia, prevesical fat, and vesical layer of the pelvic fascia. The lower flap is then dissected downwards off the anterior bladder wall for about 4 cm. and approximated with

two or three interrupted sutures to muscle at the lower angle of the wound. The two spaces are thereby securely shut off.

C. FRED GORMAN, M.D.

Marshall V. F. and Schnitman M.: Vaginal Cystectomy *J Urol* Balt., 1947 57 848

Vaginal cystectomy is done with the patient in a moderately exaggerated lithotomy position and the cervix is pulled down with a tenaculum to expose the anterior vaginal wall. A transverse incision is made completely through the vaginal wall approximately 2 cm. anterior to the cervix and 4 or 5 cm. in length. The cervix is separated from the bladder by inserting a finger into the loose tissues thus exposed between these 2 organs a common step in gynecological operations. From either end of this transverse incision parallel extensions are carried laterally and outward to the external sides of the labia minora. There is then a rectangular area of the anterior vagina which is outlined by the transverse incision anterior to the cervix the parallel lateral incisions and the vestibule. Gauze packing is placed in the vagina to control the moderate oozing after ligation of any actively bleeding vessels.

According to the extent of the lesion, the clitoris is not included in the next incision which encircles the urethral meatus at a radius of at least 3 cm. and includes at least the upper half of each labium minus as well as some of the labia majora. The removal of considerable labium majus not only provides a wider margin for tumor removal but greatly aids the exposure for future steps. This was carried down to the peritoneum of the pubis and the ends of this somewhat circular cut were joined to the ends of the lateral vaginal incisions. Numerous vessels usually required ligation at this stage but they are easily located.

The upper portion of the mass to be removed was separated from the peritoneum until the pubic arch was visualized. An incision was then made immediately adjacent to and parallel with the bony arch through the triangular ligament. The fingers could now be inserted easily into the loose tissues of the space of Retzius which was opened widely and bluntly. If the fingers are kept close to the peritoneum the venous plexus between the urethra and bladder neck and the symphysis are largely avoided and removed as part of the specimen. Clamps are applied to the urethra or bladder neck for traction. A straight prostatic tractor through the urethra may be used, but in some cases it may traumatize the neoplasm excessively. The lateral supports of the bladder are now on tension and are clamped and transfixed on either side until the ureters are cut across. Up to this point vision is excellent and the danger of injuring important structures seems almost nil, since urinary diversion is obviously prerequisite to cystectomy. In order to prevent possible clamping of the bowel in the cul-de-sac, or clamping the uterine arteries, and to avoid unnecessary lateral dissection the peritoneum is now identified and

opened. This is usually most easily accomplished by pulling down on the dome and dissecting slightly to one side of the midline to avoid the possibly adherent area of the urachus. The peritoneum is peeled off the posterior bladder wall as far as it will easily go in order to cut under vision the urachal remnants when this is necessary.

In some instances this blunt dissection is so easy that the previous ligations are met without further need of clamping in which case it is not necessary to open the peritoneum. The separation of the highest portions of the bladder from the peritoneum is, thus, far the only difficult step, since it is the most remote dissection and in an area with few definite landmarks. However if the slightest difficulty is encountered, a well exposed area of peritoneum is carefully oriented. Then with a finger inside of the peritoneum the remaining tissue to be clamped and ligated are at once evident, which prevents unnecessary lateral dissection and provides excellent orientation. Also the possibility of including bowel in a clamp is easily avoided by this maneuver. A patch of peritoneum on the posterior bladder wall is frequently removed with the specimen. The peritoneum is closed with a continuous suture.

Chronic catgut sutures are placed in the neck of the cervix and into the peritoneum and ligaments of the pubic arch. This moves the uterus and cervix down to plug the space previously occupied by the bladder. One rubber drain is placed on either side of the cervix and into the retroperitoneal space and the external ends are sutured to the vulva. The vaginal wall incisions are now approximated with interrupted single catgut sutures and the skin is placed for from 5 to 7 days. Penneal flushes are given daily but no douches, as the latter might force material into the operative space.

JOHN A. LOSE, M.D.

Minck, Bernard D.: and Zheutlin, Bertram: Penile Ulcer Caused by the *Micrococcus Tetragenus*. *Bull. Johns H. Hosp.* 947 80 98.

The *micrococcus tetragenus* is a gram-positive coccus frequently associated with the tubercle bacillus and the sputum, especially with the tubercle bacillus and with Pfeiffer's bacillus. The organism has distinct bacteriological characteristics. It is ordinarily not virulent and the infection follows a predisposing condition, usually an infectious disease, which reduces the resistance of the host.

The disease begins abruptly and the severity of its course is variable. There are chills, remittent fever, leukocytosis, and occasionally splenomegaly. The infection may become localized and cause pneumonia, arthritis, empyema, meningitis, and endocarditis. The occurrence of perinephric abscess and of pyosalpinx has been reported.

The authors report the first case of penile ulcer caused by the *Micrococcus tetragenus*. A 39-year-old white soldier suffered an injury to his penis by impact from a fall. He admitted having practiced fellatio

about 20 days before the injury. He presented swelling of the glans penis with an excoriated ulcer at the meatus, without induration or discharge. Laboratory studies were essentially negative, but anaerobic cultures produced a pure growth of organism identified as the *Micrococcus tetragenus*. The lesion improved after 4 weeks of treatment with zinc peroxide, azochloramide, penicillin and sulfonamide. Normal urinary and sexual functions were regained.

JOSEPH E. MAURER, M.D.

GENITAL ORGANS

MacDonald, B. A., and Powell, R. E.: Gelfoam in Prostatic Surgery. *J. Urol.*, Balt., 1947 57 81.

The authors used gelfoam as a hemostatic agent in 15 cases of suprapubic prostatectomy by the following method:

The gelfoam was prepared during the "setting-up" stage of the operation, soaked in a solution of thrombin in which it was kneaded to expel air from its numerous pores. Following removal of the gland, major arterial bleeding was controlled by ties, then the prostatic fossa was completely filled with gelfoam. Four or 5 pieces of the material are placed into the prostatic fossa and then suction is applied to draw the blood up into the interstices of the foam where a fibrin coagulum is formed. The cavity is filled as snugly and completely as possible with any amount of gelfoam necessary. The foam is pressed well under any encircling rim of the bladder mucosa which helps to retain the substance in place. A small straight sump tube is fastened high in the fundus of the bladder away from the prostatic cavity and simple bedside or suction drainage is employed.

In the authors' group of cases hemostasis was satisfactory in all save one case, in which there was probably arterial bleeding. There were no clots formed and the drainage was clear in from 48 to 72 hours. It is believed that with the use of gelfoam or similar substances, the mortality rate in prostatic surgery should be considerably reduced.

ROBERT O. BRANSON, M.D.

Mayor G.: Tuberculous Epitheliumitis and Its Surgical Treatment (Die Epitheliumitis tuberculosa und ihre chirurgische Behandlung). *Heft. chir. med.* 947 4 28.

In the Inselspital of Bern, Switzerland, 133 cases of tuberculous epitheliumitis were treated surgically in the urological department headed by Wildbolz. This number did not include the patients with the so-called nonspecific epitheliumitis that is, those with tuberculous disease elsewhere but no histologic findings of tuberculosis in the removed specimen. Excluded also from this number were those with primary local involvement of the testicle from primary local infection elsewhere. All but 26 of the 133 patients could be traced later. Of these 107 patients, 28 (26.1%) had previously been operated upon for renal tuberculosis, all of the latter are now well. Twenty six (24.7%) were operated upon later for

renal tuberculosis these also are all in good health. Two patients developed bone tuberculosis later and these are still under treatment. Four (3.6%) have died of generalized tuberculosis, and 6 (5.4%) of causes other than their tuberculous disease. The remaining 41 patients (38.4%) have remained well and have never shown any other evidence of the disease.

However these figures do not adequately portray the success attained in this material. In 73 of these patients the epididymitis represented the first evidence of the disease and in 32 of these (43%) tuberculous complications were found elsewhere later in 41 (57%) no tuberculous complications were ever found. Operation was instituted at once in all of these cases and in 60 per cent of them the single operation resulted in permanent cure of all the tuberculous manifestations. The author believes that this result was so dramatic that it pointed the way for a change in the method of treatment of tuberculous epididymitis.

The operation of choice has been epididymectomy or even epididymectomy with partial resection of the testicle because of the impact of unilateral orchectomy (castration) on the usually depressed psyche of these predominantly youthful individuals. There is, of course, also the possibility of bilateral involvement and the necessity of removal of the opposite testicle. As a rule the incision is placed rather high toward the base of the scrotum after preliminary ligation of the vas. The testicle is then pulled up into the wound and the epididymis is separated, care being taken to avoid injury to the testicle and the arteries supplying it. In the presence of scrotal fistula following the preliminary ligation of the vas the epididymis is removed en bloc with as much as necessary of the attached scrotal tissues to leave a clean wound. A scrotal drain may be left in place for a few days and the patient is ultimately discharged to a mountain resort for 1 or 2 months before being permitted to return to work. As a rule the postoperative course is symptomless. The patient's testicular foci (prostatitis seminal vesiculitis) begin at once to show that the condition is improving. In this material there have been no secondary operations on the prostate or vesicles. Preventive vasectomy was not done as the condition may become bilateral and then every effort must be directed to preserving the reproductive capacity of the young male patients. As a rule the surgical treatment preceded the instrumental examination of the urinary tract and no attempt at instrumentation was done until after healing of the secondary foci in the prostate and seminal vesicles occurred.

JOHN W. BRENNAN M.D.

Riba, L. W.: Operation for Varicocele. *J. Urol.* 1941, 104: 57-59.

Riba states that there are two anastomosing venous drainage systems. The deep system consists mainly of the internal spermatic vein, the ductus

deferens vein and the external spermatic vein. The superficial system consists of the superficial and inferior epigastric veins, the superficial internal circumflex veins, and the scrotal tributaries of the superficial and deep external and internal pudendal branches. These superficial veins communicate with each other and connect with the external spermatic vein of the deep system through the cremasteric branches at the external ring. On an anatomical basis excision of the internal spermatic vein without destruction of the anastomosing branches linking the deep and superficial systems would seem to be the operation of choice. The improved circulation should prevent further testicular atrophy.

Conventional varicoectomy frequently does not relieve the symptoms and at times the operation seems to aggravate symptoms. The author describes 23 cases in which excision of the internal spermatic vein was performed. Sixty five per cent of the patients were given sodium pentothal intravenously and spinal anesthesia. A 5 or 6 cm. incision was made over the left inguinal canal 1 cm. above the external inguinal ring (the latter should not be divided). Hemorrhage must be avoided. Eye surgery instruments are valuable. After exposure of the cord the inguinal portion of the vein is readily exposed by incision of the infundibuliform fascia immediately covering it. Without bleeding the vein in one or more trunks may be easily dissected away from the underlying spermatic artery. Three or more centimeters of the vein are resected. The cut ends are ligated with nonabsorbable sutures, and the fascia is closed transversely over them. A search is made for a hernial sac and, if present, a herniorrhaphy is performed. The fascia of the internal oblique muscle is sutured to the inguinal ligament (silk or cotton sutures are used for closure) and the scrotum is placed in a suspensory. The patient is kept in bed from 7 to 10 days. Scrotal amputations are unnecessary. Eighty symptoms and were satisfied. All of the varicoceles shrank after surgery. DAVID ROSENBLUM, M.D.

Engle, E. T.: The Testis Biopsy in Infertility. *J. Urol.* 1947, 57: 789.

Engle states that an understanding of the basic cause of azoospermia or oligospermia cannot be afforded by the sperm count alone. The testis biopsy affords important and frequently crucial information in these cases. The testis biopsy and semen analysis should be studied together. Each method is supplemental to the other.

In many cases of azoospermia there is a history of gonorrheal infection with bilateral epididymal occlusion. If the epididymis is found to be indurated on examination and there is a lesion in the lower portion of the duct of the azoospermia is known to be vasoeididymal anastomosis is desired. A testis biopsy is urgently indicated. The biopsy will indicate those cases in which the testes are actually producing spermatozoa and in which an attempted

TABLE I.—SEMEN ANALYSIS AND TESTIS BIOPSY

Semen analysis	Testis biopsy
Normal sample	
Azoospermia	With demonstrable occlusion Normal tubules Disturbed spermatogenesis b. Without demonstrable occlusion Normal tubules Progressive tubular fibrosis a. Germinal aplasia Spermatogenic arrest (no spermatocytes I)
1. Oligospermia	a. With high frequency of abnormal spermatozoa Incomplete maturation Progressive tubular fibrosis b. Inflammation and infection

anastomosis is justifiable and will eliminate those in which the testis itself is inadequate. A normal testis with adequate spermatogenesis may be revealed at biopsy even though there is bilateral occlusion.

The most frequent cause of azoospermia is mechanical blockage of the duct system of the testis. Primary atrophy associated with thickening and hyalinization of the wall of the seminiferous tubules is common even in young men. In old age testicular atrophy resulting from tubular fibrosis is common but this condition is not restricted to the older age groups alone. In the author's series of patients from 30 to 40 years of age, the lesion showed characteristic changes involving the tunica propria and the basement membrane of the tubule. The tunica propria showed an increased thickness due to lamination and hyalinization of the collagenous fibers. The basement membrane was demonstrably thickened, but to a lesser degree. The epithelium in various tubules showed several stages of atrophy and denudation. In tubules which were completely fibrosed no residual lumen and no epithelium were left. In the tubules with a lesser degree of atrophy all epithelium was lost at times except the Sertoli cells. Among the fibrosed tubules there were some with seminiferous epithelium containing several stages of spermatogenic cells. An occasional sperm head in the testis tubules was seen even in cases with no sperm in the semen specimens. No lesions were demonstrated in the arterial system of such testes. The interstitial cells were normal in number and secretory in appearance.

Because this is a lesion occurring in younger men, but found in increasing frequency in each successive decade, the author has called the condition progressive tubular fibrosis. There is no known cause for this type of fibrosis although it is presumably not of endocrine or nutritional origin. The process is apparently irreversible and there is no evidence that its course can be arrested. Fibrosis of the tubule in younger men implies no impairment of the androgenic function or hormone production.

Germinal aplasia is characterized by complete or almost complete absence of all cells of the germ cell

type, including the parent cells, the spermatogonia. The tunica propria is not thickened or hyalinized. The contour of the tubules is regular and they are not shrunken as in progressive tubular fibrosis. The only epithelial cell present within the tubules is the sustentacular cell of Sertoli. Because of the absence of cells of the germ cell type, this condition is called germinal aplasia. However, the term does not indicate whether this absence of germ cells is congenital or a result of later tissue injury.

The Sertoli cell of the testis tubule is recognized primarily by its nucleus. The nucleus is ovoid and has a brightly staining nucleolus. There is frequently a groove on the surface of the nucleus, which may give it the appearance of a grain of "puffed wheat." The cytoplasm of the Sertoli cell is vague in outline and is but faintly acidophilic. Cell membranes can be distinguished only at the base of the cell. The apex of the cell apparently consists of diffuse cytoplasm without a definite cell membrane. The Sertoli cell is structurally quite unlike any spermatogenic cell in the testis tubule. The interstitial cells are normal in character and number. This condition is found after irradiation of the testes and in cryptorchid testes of late adolescents. The author was unable to elicit any pertinent causative history in the series, however.

No history of cryptorchidism, radiation, continued febrile disease or of industrial experience which might be a contributing factor was found in these cases. The authors describe germinal aplasia as a pathological condition in otherwise healthy young men which was little known previously. Since the tubules are denuded of even the spermatogonia, these cases do not hold promise for any type of therapeutic management.

Another pathological condition of the testis is described which is characterized by tubules of normal size and configuration with normal spermatogonia and a great abundance of large primary spermatocytes, but no further stages in spermatogenesis. The large primary spermatocytes cannot be confused with any other cell in the tubule. They are the largest cell present, with distinct cytoplasm and a large nucleus. The chromatin of the nucleus in the usual resting stage is very distinct. In these cases spermatogenesis proceeds uniformly throughout spermatogonial division to the formation of the primary spermatocyte. These cells do not then divide again to form secondary spermatocytes; cell division is halted at this stage, and so the designation of spermatogenic arrest is made. Reduction division does not occur there are no secondary spermatocytes, and there is an abundance of cellular debris in the lumen of the tubule, which indicates that the primary spermatocyte failing to undergo reduction division, soon disintegrates. The testis of the hypophysectomized rat is quite similar to the testis found in the cases described and designated as spermatogenic arrest. In the rat in which the pituitary gland is removed before sexual maturity the spermatogenic cells develop normally through the stage of the primary

spermatocyte and no further. Secondary spermatocytes are not formed. In the rat hypophysectomized after sexual maturity a regression of the epithelium of the seminiferous tubules occurs. All mature sperms and secondary spermatocytes disappear but mitotic activity continues in the primary spermatocytes. This condition in the rat is quite similar histologically to that seen in the cases of spermatogenic arrest in man. In these cases there was no evidence of hypopituitarism or hypothyroidism. Repair of this condition in the rat occurs promptly after the application of gonadotropic hormones. The author was unable to elicit evidence that the gonadotropic hormones which are available for clinical use repairs this type of testicular deficiency in man.

The effects of the removal of the hypophysis in the rhesus monkey are significantly different from those in the rat. In the monkey the atrophy of the testis after hypophysectomy is more extensive than in the rat. The seminiferous epithelium very largely disappears. Primary spermatocytes do not remain as in the rat. A few of the original spermatogenic and the Sertoli cells remain. This is the common condition seen in the testis of boys and young adolescents in whom other metabolic disturbances of hypopituitarism occur.

These three categories of testis pathology represent diverse histological states and exhibit azoospermia of gonadal origin, but there is no known therapeutic medium which will restore spermatogenesis in these testes.

Patients with oligospermia, with sperm counts ranging from very few sperms up to from 40 to 60 million are much more difficult to classify on a morphological basis. Some of the testes from these patients represent early stages of progressive tubular fibrosis in which many tubules are structurally normal, but in which the total sperm production is seriously reduced. The overall impression obtained from an examination of testis biopsies from cases with oligospermia is that there is a reduced rate of spermatogenesis. In any normal testis not all stages of spermatogenesis are usually found in every cross section of a tubule. One area will show the primary spermatocyte in preponderance. In a second area

the secondary spermatocyte will be most numerous while in a third maturing sperms will be enmeshed within the cytoplasm of the sustentacular Sertoli cells. The tubules of testes which produce a small number of sperms have all of the components of the normal testis. Each cell is represented in proper proportion, but all are apparently reduced in number. It must be stated that this is an impression because no counts or statistical evaluations have been made.

Even though there is an abundance of tubules with all stages of spermatogenesis the spermatids may not mature into spermatozoa. This transition from spermatid to spermatozoa is histologically speaking a process of eliminating excess cytoplasm. Other unknown metabolic processes occur during this ripening process. It does appear however that much of the maturational process must take place while the sperm cell is enmeshed within the cytoplasm of the Sertoli cell. This is the state in which most tubular spermatozoa are found in the normal testis. In the normal testis, free spermatozoa are rarely seen in the lumens of the tubule. In testis biopsies of patients with oligospermia, the spermatozoa frequently are found as free cells in the lumen of the tubule. The spermatozoa are apparently not undergoing the needed maturation within or in contact with the cytoplasm of the sustentacular cell of Sertoli. The causes for these various testis tubule disturbances are obscure although obesity and hypothyroidism associated with oligospermia, as well as parotitis with associated orchitis may be a contributing cause.

Histological evidence of inflammation and infection in the testis is not common and is rarely seen in the cases in which the primary complaint is infertility. Charny has described conditions resulting from toxic states, which do not have a characteristic pathology. Doubtless many toxins affect the cytological condition of the testis adversely, but it is exceedingly difficult to determine what such substances may be. Indeed surgical manipulation of the tissue and poor fixation of the biopsy cause much cellular distortion which might be interpreted as being due to some hypothetical noxious agent.

DAVID ROSENBLUM, M.D.

SURGERY OF THE BONES, JOINTS, MUSCLES, TENDONS

CONDITIONS OF THE BONES, JOINTS, MUSCLES, TENDONS, ETC.

Ferrero C.: Jaffe-Lichtenstein's Disease, Cystic Osteofibromatosis (La maladie de Jaffe-Lichtenstein, ostéofibromatose kystique) *Presse méd.*, 947 55 143

In 1938, Lichtenstein described a polyostotic fibrous dysplasia consisting of a segmentary osteolytic process involving the diaphyses and metaphyses of the long bones. The disease begins in the medullary portion of the bone and extends by progressive erosion into the cortex. Cystic or vaguely defined lesions develop insidiously until claudication or spontaneous fracture occurs as the first clinical evidence of the disease. While the condition is more common in the first two decades of life, it is also occasionally observed in older subjects with a history of repeated fracture. Pain is present only following fracture or when the lesion causes compression of a nerve. Mobility is not affected and the joints are intact. The blood chemistry is normal except in extreme cases. Roentgen examination reveals bone cysts, and practically normal consolidation of fractures with occasional osteomalacic callus. The structure and shape of the long bones are changed. Processes of extension or partial regeneration may confuse the image.

The most frequent localizations are the neck of the femur, the tibia, cranium, pelvis, ribs, phalanges, vertebrae, scapula, clavicle, metacarpals, and other bones in the order given.

The enlarged medullary cavity surrounded by an attenuated cortex is filled with fibrous tissue. The medullary tissue is replaced by a fibroma with pale fusiform cells which become progressively immature toward the periphery. The fibroma invades the cortex by peripheral extension via the Haversian canals. Vascularization is poor and hemorrhagic foci are rarely encountered. The arterial changes resemble somewhat those seen in neurofibromatosis. There is no inflammatory reaction and no marked osteoclastic or features characteristic of Recklinghausen's osteitis. The disease progresses by stages, with remissions occasionally lasting for years, and as a rule, final stabilization. The general health is not affected and malignant degeneration is quite exceptional. The disease must be differentiated from Recklinghausen's generalized fibrous osteitis and xanthomatosis. Certain "formes frustes" of xanthomatosis are in reality Jaffe-Lichtenstein's disease.

Jaffe-Lichtenstein's disease is caused by a deficiency of the bone forming mesenchyme although some writers attribute the fibrous tissue to the terminal diarthral stage of xanthomatous morrhage, or a quiescent stage of parathyroid osteitis.

The author has observed an associated Albright's syndrome in some cases and attributes the bone

lesions to neurofibromatosis. Such an interpretation would explain the tumoral behavior of these lesions, the complex syndromes (Albright's syndrome) and the presence in 1 patient of Jaffe-Lichtenstein's disease plus the cardinal features of neurofibromatosis. Recent published cases would seem to support this theory. Also leontiasis ossea with "pagetoid" roentgenologic features and multiple bone cysts may be merely a craniofacial localization of this disease. Further histologic studies will be needed to prove the author's hypothesis that Jaffe-Lichtenstein's disease is merely a skeletal localization of neurofibromatosis.

EDITH SCHAMBER MOORE.

Agostier E., and Robbins, R.: The Changing Concept of Myeloma of Bone. *Am J M Sc.*, 1947 213 25

More than 1,000 cases of myeloma are reported in the literature and the authors add their 13 cases from Temple University Hospital only to discuss the change in concept of the disease which has developed in the past 10 years. The change in concept involves (1) a better understanding of the subtypes, (2) its complex cytogenesis (3) recently developed laboratory diagnostic procedures, and (4) the nature of bone demineralization which it induces.

Three subtypes must be recognized. The classical type occurs as multiple tumors arising in red marrow simultaneously or successively over several months. Seven of the 13 cases studied were of this type. Tumors arise anywhere where red marrow is found. They are found preponderantly in flat bones where such marrow is found. In the age group from 40 to 60 years, which is commonly affected. In the rare younger patient the long bones will be affected if the red marrow is still active there. The lytic action of the tumor on contiguous bone makes roentgen ray films of the flat bones often diagnostic. A second subtype is the so-called "solitary myeloma," which is first seen as a single focus and may remain as such for a variable length of time. Four cases first seen in the single focus stage became multiple within 9 months.

A third subtype is a myeloma so generalized that all red marrow seems simultaneously affected. This produces generalized demineralization of bone, and consequent changes in the blood. Two cases of this type in elderly persons were misdiagnosed by means of x-ray as senile, idiopathic osteoporosis. They both showed marrow replacement by tumor cells throughout the flat skeleton. All of these types may eventually produce extramedullary extensions or metastases. A soft tissue tumor morphologically indistinguishable from some of the marrow tumors is different clinically to such an extent that it is not included here.

The cytogenesis of myeloma is not well understood. The plasma cell myeloma is the most common but not the only type. If we accept the concept that all

marrow elements are of mesenchymal origin. Ewing's tumor might be classified in the myeloid group and certainly its clinical features are not too dissimilar. Its site of predilection is consistent with the distribution of red marrow in its age group. Aspirated sternal marrow has shown identical tumor plasma cells in patients whose tumors, when directly biopsied, showed myeloid types and in those whose tumors were of the plasma cell type. The concept of Lowen-haupt and others that the plasma cell type arises from the reticuloendothelial elements of marrow and spleen likens myeloma to a diffuse process such as leucemia. Many and various views are propounded on the cytogenesis of this disease.

The role of Bence Jones protein, not as commonly present as previously thought in the production of the frequently encountered renal insufficiency is dubious. Hyperglobulinemia is encountered and should be looked for as well as hypercalcemia. A marked anemia is often encountered and a nonspecific rise in the sedimentation rate. Needle biopsy of the single lesion can be done particularly when cortical destruction is marked and pathologic interpretation is not difficult.

Although spontaneous fracture of a flat bone is highly suggestive of myeloma, there is sufficient pain before the fracture occurs for earlier diagnosis of the disease. Thorough study of patients in this age group with localized flat bone or back pain would save considerable time and money. A diagnosis of idiopathic senile osteoporosis should not be accepted as proof of the absence of myeloma, but in the presence of flat bone pain, sternal puncture and other laboratory procedures should be used to confirm the diagnosis.

FRANCIS E. BRENNER, M.D.

Pontano, T.: Dorsal Kyphosis following Tetany (Il gibbo dorsale tetanico). *Riforma med.* 1947 61:1

The author briefly reviews the literature showing that the first case of dorsal kyphosis following tetany was reported in 1905 by Hautsch. He then presents 21 cases of his own which he observed during the year of 1942.

In 5 of his cases the kyphosis appeared between the fifteenth and twenty fifth days and in 16 cases between the first and twelfth days. The majority of his cases occurred in infants. In some cases the kyphosis remained while in others it was transitory in type. The kyphosis in some cases was so mild that it was asymptomatic and was found only on careful x ray study.

Pathological specimens were examined in 3 cases in 1 by the author. In none of them was there evidence of tuberculosis, toxemia or neurotrophic changes. In all of the cases the cause was found to be mechanical compression.

The cervical and lumbar vertebrae rarely become damaged because of their great mobility. Only the dorsal segment is injured because of the rigidity of this portion of the vertebral column. The area usually damaged is from the third to the sixth dorsal vertebra.

CARLO SCUDERI, M.D.

Valls, J. and Músculo, D. T.: Osteochondritis Dissecans of the Hip (Osteochondritis dissecans de la cadera). *Rev. As. med. argent.* 1947 61: 29

Valls and Músculo report 5 cases of osteochondritis dissecans of the hip. The first case was that of a 24 year old man with pain in the right hip for nearly 5 years. The pain was nonradiating, intermittent, and occurred especially after heavy exercising. Clinically a decrease of 2 cm. in the size of the thigh and a slight limp were noted. X rays disclosed a zone in the head of the femur which was the size of an almond and was separated from the rest of the epiphysis by a definite furrow. A fibrocartilaginous fragment was removed surgically. Two years later the patient showed no symptoms at all and no defect was noted in the femur roentgenologically.

In the second case that of a 17 year old boy there was a decrease in the diameter of the right thigh and right leg. On x ray examination the head of the femur appeared to be deformed with zones of variable density. Similar findings were disclosed in the third case that of a 27 year old man.

At surgical intervention in the fourth case a bone fragment was removed. Seven months later the patient appeared symptomless. The fifth case disclosed the typical appearance of the disease, but could not be followed up.

The authors discuss briefly the pathogenesis, clinical and radiological picture and treatment of the disease.

WILLIAM E. RICHARDS, M.D.

Sutro, C. J.: Prominent Inner Malleolus; A Cause of Painful and Enlarged Ankle Region. *Am. J. Roentg.* 1947 57: 472

An abnormal prominence of the inner malleolus of the tibia was noted in each of 10 soldiers who had complained of recurrent pain and swelling of a single ankle. The soldiers sought permission to wear low quarter instead of the high G.I. shoes. Clinical and roentgenological examinations were made of 100 ankles in 50 soldiers who had no obvious disturbances of the feet or ankles for purposes of comparison with the prominent and painful ankles in other soldiers. When lateral bowing of the distal third of the leg was present the outline of the inner malleolus appeared to be unduly prominent. When the contour of the leg was straight the projection of the inner malleolus was barely perceptible. In none of the 100 ankles was there any evidence of soft tissue thickening over the inner malleolus. An analysis of the roentgenograms indicated that the axis of the internal malleolus was approximately at 30 degrees to a perpendicular from the region of the articular surface of the distal end of the tibia. The width of the internal malleolus was commonly found to approximate $\frac{1}{4}$ of an inch.

Five of the 10 patients who had made requests to wear low-quarter shoes had suffered from a sprain or fracture of one ankle, 3 to 15 years prior to the first visit to the clinic. They complained of pain and swelling of a single ankle which was aggravated by the wearing of high shoes. In civilian life they had worn low-quarter shoes and had experienced only a

minimal degree of pain and swelling. No evidence of any subcutaneous burnae was found nor was there an unusual lateral bowing of the tibia. Each had 5 to 10 degrees of restriction in the range of active and passive dorsiflexion in the affected ankle. Roentgenograms disclosed irregularity in the contour of the affected inner malleolus as well as an enlargement of the part manifested by widths between $\frac{3}{16}$ and $\frac{1}{2}$ of an inch. The malleolar angle ranged from 30 to 35 degrees. Hooklike projections formed by periosteal proliferation in the region of the inner malleolus were present. In 1 of the 5 there was present in addition to the periosteal changes, a unilateral accessory bone (os subtibiale) over the tip of the affected malleolus.

In the remaining 5 patients, who did not experience any previous local trauma, roentgenographs revealed 3 patients with trapezoid configuration or lateral bowing of the distal portions of both tibiae. One patient had anomalous flat sessile mounds on the attenuated cortices of both inner malleoli. The remaining patient showed a trapezoid configuration of the distal end of one tibia. All 5 patients demonstrated just above average determinations roentgenographically for the malleolar angle and width. Subcutaneous soft tissue swellings were present only over the painful malleoli in each of these 5 patients and they formed a good part of the local prominence.

Low-quarter shoes were prescribed to lessen irritation to the prominence. This, in conjunction with hydrotherapy, infra red radiation and limitation of military duties, resulted in definite alleviation of pain and diminution in the size of the soft tissue swelling. In no instance was the intrinsic shape or contour of the inner malleolus modified by this treatment.

KENNETH H. SPOONER, M.D.

SURGERY OF THE BONES, JOINTS, MUSCLES, TENDONS, ETC.

Lamphier, T. A., and Cushman, C.: Treatment of Chronic Osteomyelitis with Streptomycin. *N. England J. M.* 1947 36 318.

There is no doubt that penicillin helped to eradicate and localize bone infections in World War II. Bacteremia and septicemia were rare but many soldiers returned with mixed infections that did not respond to penicillin. According to Abraham and Chalm, gram-negative bacteria produce a penicillin inhibiting enzyme called penicillinase. The gram-negative bacteria found most frequently and considered responsible for delayed wound healing were *Pseudomonas aeruginosa*, *Proteus vulgaris*, and *Aerobacter aerogenes*.

Asochloramide, acriflavine, and Dakin's solution were of doubtful value. Careful removal of x-ray opaque and nonopaque foreign bodies or necrotic tissue is important.

Four patients who did not respond to treatment with penicillin, sulfonamides, local antiseptics, and radical sequestrectomy were chosen for streptomycin therapy. The cultured bacteria were studied for

streptomycin sensitivity in vitro. Three to four days after thorough wound debridement, gelatin or fibrin foam soaked in streptomycin was applied to the entire open wound. 150,000 units of streptomycin were used locally and 300,000 units were given intramuscularly every 3 hours. *Pseudomonas aeruginosa* was found highly resistant to streptomycin both in vitro and in vivo but preliminary treatment of the wound with 1 per cent acetic acid solution and subsequent careful irrigation with saline solution was successful in overcoming this obstacle.

Three patients were treated with combined local and intramuscular streptomycin and one was treated with local streptomycin alone. The results were gratifying. Skin grafting and secondary closure were made possible in a much shorter time. However, observation for a period of several years will be necessary to exclude possible recurrences (previously observed in cases considered cured?).

Pain from repeated injections of streptomycin was alleviated by the addition of procaine. No toxic reactions were observed in this series.

ARTHUR J. LEMER, M.D.

Bateman, J. E.: Management of Extensive Complicated Defects in the Long Bones. *Am. J. Surg.* 1947 73 433.

In the repair of bone defects several preliminary steps have to be taken into consideration.

In spite of very valuable chemotherapeutic agents no surgery should be done until 6 months have elapsed after the cessation of drainage from the area. The skin covering the bone defect must have a good blood supply and must not be adherent to the underlying bone structures. A plastic procedure may be necessary. The suture of severed nerves is often indicated before repair of the bone defect is undertaken. Early nerve suture is beneficial and is not likely to activate previous infection. The existing bone defect may allow end-to-end nerve suture. Transplantation of the nerve will often facilitate repair of the bone defect.

The author carried out experiments on beef bone grafts to determine the breaking point and resistance to torsion. He came to the conclusion that dual onlay bone grafts are the most resistant to breaking (100 lb.) and torsion. Their use in the repair of bone defects is recommended.

A brief analysis of different types and shapes of bone grafts is outlined. The repair of defects in individual tubular bones is discussed in some detail with the help of diagrams and roentgenograms.

GROSVOR I. RIZZO, M.D.

Gabrizio, A.: Indications and Limitations of Surgery in Ischemic Paralysis (Indicazioni e Limiti nella chirurgia delle paralisi ischemiche). *Chirurgia moderna*, 1946, 30 3.

The author discusses various forms of treatment which have been recommended for ischemic paralysis of the forearm. He reports 3 cases of his own giving the complete clinical details in each case.

In pronounced cases of ischemic paralysis he recommends aponeurotomy and eventual open reduction of the fracture with surgery of the nerves and vessels if indicated.

In mild cases of ischemic paralysis he recommends elastic traction and careful observation.

In old cases he recommends the detachment of the insertions of the muscles from the epitrochlear region and plastic lengthening of the flexor tendons of the hand.

CARLO SCUTSCHI M.D.

Jerre T. : A Modification of the Nicola Operation for Recurrent Dislocation of the Shoulder Joint
(Eine Modification der Nicola'schen Operationsmethode bei habitueller Schultergelenkluxation)
Acta chir. scand., 1947 95 :

Recurrent dislocation of the shoulder joint has been of great interest to surgeons. In addition to operative procedures different types of orthopedic appliances to prevent dislocation have been investigated. These appliances were designed to prevent the motions in the shoulder joint which might cause the humerus to dislocate. I.e. predominantly in abduction. Furthermore the appliances gave additional protection to the anterior aspect of the shoulder joint in the usual anterior shoulder dislocations. Yet the disabling factor associated with the use of appliances is striking and most likely this type of treatment has been completely abandoned except in cases in which a minor operation is contraindicated.

Numerous operative procedures have been described, several of which are of historical interest only. Different procedures were tried to prevent redislocation of the shoulder joint for example resection of the humeral head, arthrodesis of the shoulder joint, different types of capsulorrhaphy, deepening of the fossa glenoidalis, fixation of the humeral head to the acromion, the coracoid process, or the superior rim of the glenoid fossa by the use of wire, fascia lata, the long peroneus tendon, the long or short tendon of the biceps muscle, by elevation of the anterior rim of the glenoid fossa with the use of bone graft, os purum, or by elongation of the coracoid process. Also different muscle transplantations, suture of the labrum glenoidale, or suture of the capsule directly to the bony rim of the glenoid fossa (in which holes were drilled prior to the suture of the capsule) were tried. It is beyond the scope of this article to discuss in detail all the suggested operative procedures. A short description of the Nicola operation and its modifications will be given.

In 1927 Heymanowitsch described an operative procedure for the treatment of recurrent dislocation of the shoulder joint of which there were two modifications. In the first modification the long head of the biceps muscle is severed close to its origin. Then a canal is drilled into the lateral aspect of the humerus in an anterior inferior to posterior superior direction. The tendon is then threaded through the canal and fastened to the acromion process. In the second modification the long head of the biceps is dissected out. However the tendon is cut at the level of the

surgical neck. Then a canal is drilled into the humeral head in such a manner that its superior opening comes to lie close to the origin of the tendon and the proximal glenoid rim. The proximal portion of the tendon is then inserted into the proximal opening of the canal and pushed through the canal to emerge from its distal opening. It is then sutured to the distal end of the tendon.

In 1929 Nicola described an operation (without mentioning Heymanowitsch) which differed in only minor details from the second modification of the Heymanowitsch operation. Nicola also frees the long head of the biceps up to its origin and severs it 2.5 cm. distal to the transverse ligament (the transverse ligament extends from the greater to the lesser tubercle and bridges the intertubercular canal). Then a canal is drilled into the humeral head from a point just distal to the transverse ligament and in such direction that its proximal opening comes to the center of the humeral head. The proximal portion of the tendon is then guided through the canal from above downward and sutured to the distal end of the tendon. Then the proximal portion of the tendon is put under tension and sutured to the periosteum near the transverse ligament to eliminate tension on the suture line between the proximal and distal portion of the tendon. This procedure is often referred to as the Heymanowitsch-Nicola operation or as the Nicola operation. It is widely employed.

Wahl described a modification of this technique in 1931. The tendon of the long head of the biceps is dissected out and severed from 2 to 3 fingerbreadths distally to the greater tubercle. The distal portion of the tendon is then sutured to the periosteum within the intertubercular canal. A canal directed in a posteroinferior direction is drilled into the greater tubercle from the proximal portion of the intertubercular canal. The proximal portion of the tendon is threaded through the artificial canal, folded over the inferior bony rim and sutured to the adjacent structures.

In 1933 Hobart suggested a more anatomical course of the tendon through the humeral head with out any sharp angulation and trauma to the tendon lying between the humeral and the glenoid fossa.

In 1933 Roberts published another modification. In 1934 Nicola again mentioned his method of repair incidental to a re-evaluation of his procedure. In this description of the procedure he states that the canal is to be constructed in such a way that its distal opening is located from $\frac{1}{2}$ to $\frac{1}{4}$ inch distally to the edge of the articular cartilage of the humeral head.

In 1935 Hobart described a procedure in which two operations were combined. First the modification of the Nicola operation described by Hobart is used and this is followed by a Chairmont-Ehrlich muscle plastic operation.

In 1935 Rupp sutured the tendon to the periosteum of the intertubercular canal at the level of both tubercles.

In 1940 Janek described a method similar to the Roberts modification which had been used by Frey

ka since 1933. Frejka frees the tendon of the long head of the biceps. Then the intertubercular canal is deepened and extended proximally. The tendon is then placed into the long and deep channel short end distal to the intertubercular canal and also sutured to the periosteum. The bone chips which were procured by the deepening of the intertubercular canal are used to cover the tendon which lies in the depth of the canal. The following advantages as compared with the original procedure described by Nicola are cited by Frejka. Deepening the intertubercular canal is less difficult than drilling a canal through the humeral head. There is less damage to the articular cartilage. There is no need to open the capsule widely. The tendon of the long head of the biceps is not divided. Therefore there is no danger of tearing of the sutures and slipping of the proximal portion of the tendon out of the canal, which might occur in Nicola's procedure.

In 1941 Ahlberg published a method which was said to have been used by Kjell Bergman in 1934. The tendon of the long head of the biceps is freed and divided just distal to the greater tubercle. The distal portion of the tendon is sutured in the intertubercular canal under an elevated bone fragment. The proximal portion is placed medial to the lesser tubercle and sutured underneath a bone fragment raised in the lesser tubercle. Ahlberg considers the Kjell Bergman method a less drastic procedure. The division of the tendon which constitutes a drawback in the Nicola operation is decreased in this procedure because the tendon is fixed under a raised bone fragment.

In 1945 Camitz mentioned another modification. The tendon of the long head of the biceps is dissected free. With the use of a chisel a channel is constructed alongside and underneath the lesser tubercle and wide enough to allow the tendon to be placed into it. There the tendon is fastened with catgut and with one or two silk sutures. In his address at the meeting of the Swedish surgeons in 1945 Camitz stated that his method simply consists of freeing the long tendon of the biceps, after exposure of the joint, all the way up to its origin at the supraglenoid tuberosity and far enough down to allow the tendon to be pulled over the greater tubercle and fixed in a channel underneath the lesser tubercle.

In 1943 Stenport began to use the following method in the repair of recurrent anterior dislocations of the shoulder joint at the Institute for the Crippled at Helsingborg. The patient is given ether anesthesia and his arm is placed on a table at 90 degrees abduction. A pillow is placed underneath the shoulder. A skin incision is made from the acromioclavicular joint along the anterior border of the deltoid muscle distally for about 10 cm. The cephalic vein is located in the cleft between the anterior edge of the deltoid and the pectoralis major muscle. The deltoid muscle is retracted laterally and the pectoralis major and the cephalic vein are retracted medially. The intertubercular canal is located by rotation of the arm. The transverse ligament bridging

the intertubercular canal is cut and the underlying long tendon of the biceps is exposed. The tendon is dissected free up into the shoulder joint, which makes it necessary to cut into the joint capsule. The arm is rotated externally to bring the lesser tubercle and the medially adjacent structures into the operative field. The tendon of the subscapularis muscle is severed at its insertion on the lesser tubercle and on the uppermost portion of the crest of the lesser tubercle. (Portions of the subscapularis muscle are also directly inserted on the joint capsule.) With the use of a chisel, a channel is constructed just medial to the lesser tubercle. The tendon of the long head of the biceps is pulled out of the intertubercular canal and over the lesser tubercle and placed into the newly constructed channel medial to the lesser tubercle. The tendon is fastened to the bony walls with catgut and silk sutures. (In the more recent operations, bone chips which were procured by the construction of the channel were placed on top of the tendon to form a roof over it.) The previously cut tendon of the subscapularis muscle is resutured to the periosteum of the lesser tubercle. The anterior edge of the deltoid and the pectoralis major muscle were approximated with 3 or 5 catgut sutures. The skin is united with silk or cotton sutures. The arm is placed immediately in 90 degrees of abduction and approximately 30 degrees of flexion and maintained in this position in an abduction splint. The patient is allowed to become ambulatory after 3 days. The abduction splint is kept in position for 14 days (previously it was kept on much longer). Then the patient is allowed to use active motion and the treatment is completed by eventually adding passive motion, massage, and heat therapy.

Nicola's operation and its modifications are not based on any pathologic-anatomical considerations and have for their aim only the fixation of the humeral head to the glenoid fossa. It has been established that there is a specific pathologic-anatomical cause for the recurrent shoulder dislocations which differs from the cause of common traumatic dislocation of the shoulder joint. The first dislocation is the recurrent type of dislocation of the shoulder usually occurs in younger individuals, while the traumatic dislocation usually occurs in middle aged or older patients. The recurrent dislocation of the shoulder is very rarely associated with tear of the supraspinatus tendon or fracture of the greater tubercle which is often found in traumatic dislocation of the shoulder. Various authors have stressed those and many other differences between recurrent and traumatic dislocation of the shoulder joint. It was generally assumed that a traumatic dislocation of the shoulder becomes a recurrent type of dislocation because of a constitutional tendency, primary deformity of the humeral head, tear of the supraspinatus tendon and the subsequent loss of stability of the joint, or a congenital predisposition.

Bankhart emphasized in 1938 that the recurrent and the traumatic dislocations of the shoulder joint are two different diseases, each type with its particu-

lar pathologic-anatomic basis. According to Bankhart, extreme abduction causes traumatic dislocation of the shoulder joint. The proximal portion of the humerus is pushed against the acromion and the head is lifted over the inferior rim of the glenoid fossa and out of the joint by tearing the capsule in the same area. This tear readily heals and this is why a traumatic dislocation never turns into a recurrent type. The anterior recurrent dislocation of the shoulder joint is caused by trauma to the shoulder with a force directed in a posterior-anterior line. It is either a direct trauma to the shoulder joint or a force which is transmitted to the longitudinal axis of the humerus, for example, a fall on the slightly laterally and posteriorly deviated elbow. Such an injury pushes the humeral head anteriorly out of the joint, between the glenoid fossa and the labrum glenoidale which is torn loose from its bony insertion on the glenoid fossa. The labrum glenoidale, composed of cartilage does not tend to unite with the bony rim of the glenoid fossa and this is why this type of dislocation becomes a recurrent dislocation of the shoulder joint. Bankhart was able to demonstrate these lesions in 27 consecutive patients who were operated upon. Hybbinette also found almost similar lesions of the capsule and the labrum glenoidale in his cases, which he repaired following his own intra-articular procedure. Best and Inman operated in 10 cases and Watson Jones in 34 cases following Bankhart's procedure, and were able in all cases to confirm Bankhart's findings. Meyers published a series of 31 cases in which operation was done according to Bankhart's procedure or some modification of this method. In all these cases a tear of the labrum glenoidale or a tear of the capsule near the glenoid fossa was found. Watson Jones states, however that in order to discover the tear it is necessary to sever the coracoid process, to cut the tendon of the subscapularis muscle and to dissect it away from the capsule to open the joint capsule and to force the humeral head out of the joint by having an assistant apply traction to the arm. On the other hand Odgers and Hark were able to demonstrate the tear in only 3 of 12 operations. Magnuson contends that this lesion is of no importance and was able to find it in only a few cases. Whether the tear of the labrum glenoidale occurs only in a few cases of anterior recurrent dislocation of the shoulder joint or whether according to Watson Jones, it actually composes the essential anatomical defect is irrelevant if Nicola's operation or its modifications are used since this procedure, as previously mentioned does not aim to repair the anatomical defect but is solely concerned with fastening the humeral head to the glenoid fossa.

Since 1943, 9 cases of anterior recurrent dislocation of the shoulder joint were operated upon at the Institute for the Crippled in Helsingborg by the mentioned modification of Nicola's operation. A more detailed description of these cases is outlined.

Of all the 9 patients operated upon, 1 could not be located for follow up examination. One died of an intercurrent disease but showed a good reconstruc-

tion of the shoulder joint. This patient had no complaints prior to her death. The follow up period was short in 1 case but it lasted from 1 to 3 years in the rest of the cases. There were no recurrences. The periods of hospitalization and of inability to work after the operation were short as compared with other procedures used in the repair of recurrent dislocation of the shoulder joint. Persistent symptoms were absent or very slight.

By using the modification of the Nicola operation certain advantages were gained which may be summarized as follows:

- 1 The operative technique is less difficult.
- 2 The operation is a minor one and does not necessitate wide exposure of the joint.
- 3 There is no injury to the articular cartilage.
- 4 The tendon of the long head of the biceps is not divided.

5 Finally it should be emphasized that the tendon which is used to secure the humeral head in the glenoid fossa is fastened medially on the humeral head in this modification. This is important from the mechanical point of view a fact which among others was stressed by Kapel and Nicola.

The early results obtained by using the modification of the Nicola operation can be classified as very good. It is impossible to state whether the final results will be just as good since recurrences may occur very late. In comparing the results of the Nicola operation and its modifications with the Eden Hybbinette and Bankhart methods one finds that the end results are worse following Nicola's method. In 1934 Nicola himself reviewed 32 cases which he operated upon since 1928. Recurrence occurred in only 1 case and only once. In the same publication Nicola mentions the fact that he learned of 3 recurrences which occurred in patients who were operated on in accordance with his own method but by other surgeons. Two of these 3 patients were reoperated upon. It was found that in 1 case the canal through the head of the humerus was much too large which allowed the tendon to slide up and down, and eventually caused it to tear out. In the other case the canal was found to have been wrongly placed which caused the humeral head to be unfavorably fixed to the glenoid fossa. These recurrences were due to faulty technique rather than to inefficiency of the method of repair. Roberts, Burnet, Frejka and Camils also were able to show successful results with the various modifications of the Nicola operation. Ahlberg published 4 cases without recurrences in which operation was done by the Kjell Bergman modification. On the other hand Watson Jones reported that he operated upon 18 patients according to Nicola's method. There were recurrences in 5 of the cases. Hublin used the Heymannowitsch method in 9 cases. Recurrence occurred in 3 cases 3 years after the operation, and after a reevaluation carried out at a later date it was found that all 7 patients who could be located had recurrences. Finally Thomason stated that 32 recurrences (14%) occurred in 225 patients (published in the

literature) who had been operated on by suspension methods.

The Eden-Hybbinette operation was very successful. Dahlgren published a series of 39 cases in which operation had been done according to the Eden-Hybbinette method. One patient died of pulmonary embolism, 2 patients never obtained full range of motion, 2 patients had recurrences after a bad trauma but there were no recurrent dislocations afterward. Spontaneous recurrences did not take place. Thomson who added 8 cases to the literature, which were operated on according to the same method without recurrence, gathered all the published cases which had been treated by different surgeons according to the Eden-Hybbinette method. He succeeded in collecting 169 cases which were treated according to this method, with only 1 spontaneous recurrence.

Bankhart's method of repair also has given very satisfactory results. Bankhart himself reported a series of 27 consecutive cases without recurrence. Watson-Jones, 34 cases without recurrence. Odgers and Hark, 12 cases without recurrence. Boat and Inman, 10 cases with 1 recurrence in an epileptic, and Meyers, 31 cases treated by Bankhart's method or one of its modifications without recurrence.

The results of the operations of Eden Hybbinette and Bankhart are very satisfactory as far as the number of recurrences are concerned and the results were better than those obtained with Nicola's method. The fact that the severed tendon is a weak point in Nicola's method is clear, this being stressed, among others by Watson-Jones and Frejka. Frejka states: "If the periosteal suture of the tendon relaxes, not only is the tendon itself weakened but also fastening of the shoulder joint is not achieved." In Watson-Jones' series of 18 cases treated in accordance with Nicola's operation not less than 5 recurrences occurred. Among those 4 were reoperated upon following another method. It was found that the tendon was torn in every one of these cases. Hublin reports that in 1 patient who had a recurrence after a Heymanowitch operation the tendon also was found torn but in addition it was found atrophied and stretched to such a degree that it was unable to give even the least amount of fixation of the humeral head to the glenoid fossa. Frejka, Roberts and Camits modifications do not require division of the tendon. Roberts operated in 2 cases using his own modification without recurrence. Frejka operated in 5 cases with 1 recurrence. Camits reported a series of 13 cases. He stated that in 1940 he began using his new modification without division of the tendon of the long head of the biceps. He operated in 10 cases since 1940. One patient had 2 recurrences.

The modification of the Nicola operation used at the Institute for the Crippled in Helsingborg has some advantages as compared with the original Nicola operation. This operation is preferable to the Eden Hybbinette and Bankhart operations because the procedure is less severe, the technique less difficult and the hospitalization and loss of working

time much shorter. Even if some recurrences take place at a later date, there is the advantage that a great number of patients are cured by a minor and technically easier operation. There was no need to subject them to the major operation of Eden-Hybbinette or of Bankhart with its associated dangers. Due to the less extensive operation on the shoulder joint and its surrounding structures a possible second operation because of recurrence is not made too difficult. However, this would be the case if the Eden-Hybbinette or Bankhart operation had been used.

In the summary the author describes a modification of the Nicola operation for anterior recurrent dislocation of the shoulder joint which Stenport started to use at the Institute for the Crippled in Helsingborg in 1943. On the whole 9 patients were operated upon according to this method. One of them could not be traced for re-examination. There were no recurrences. This method is recommended as it is a minor procedure, the technique is simple, the periods of hospitalization and inability to work are of short duration, and, eventually there are very minor residual complaints or none at all.

GEORGE I. RUM, M.D.

De Marchi, E.: Contribution to the Surgical Treatment of Painful Sacralization of the Lumbar Spine. (Contributo al trattamento chirurgico della sacralizzazione dolorosa della V lombare). *Chir. org. movim.* 1946, no. 438.

According to popular opinion sacralization of the fifth lumbar vertebra serves as a mechanical factor which is responsible for pressure on the nerve trunks; hence the conclusion that removal of the apophysis is indicated to relieve pain. The author disagrees with this concept and recommends apophysectomy of the fifth lumbar vertebra only after all conservative methods have failed. The main indication for the operation is a definitely identified sacroapophyseal arthrosis, especially if it is associated with a persistent deviation of the spine. The surgical intervention causes a considerable trauma and is not without danger. A coexistence of other pathologic lesions such as vertebral arthrosis or interapophyseal arthrosis must be excluded before operation is advised. Radicular symptoms may be due not to sacralization but to a concomitant hernia of an intervertebral disc; therefore myelography should be employed in every case to exclude the presence of such lesions.

The author reports 7 cases in which apophysectomy was performed with good results.

JOSEPH K. NARAY, M.D.

FRACTURES AND DISLOCATIONS

Lingley, J. R., and Robbins, L. L.: Fractures following Electroshock Therapy. *Radiology* 1947, 54: 48.

Since 1935 when Sakel in Vienna first reported insulin shock therapy for psychotics, methods of producing shock have been expanded and their use has

rapidly increased. Concurrently complications following and contraindications to shock therapy have been reported. In 1939 Polatin reported 51 cases of compression fracture of the thoracic vertebrae after metrazol treatment at the New York State Psychiatric Institute. This was a 43.2 per cent incidence most cases showing multiple fractures of from 1 to 8 thoracic vertebrae. Fracture of the pelvis, acetabulum, humerus, clavicle and scapula as well as dislocation of the jaw has been observed. The most frequent lesion is fracture of the spinal column usually the thoracic portion.

Many methods for the prevention of such trauma have been resorted to including mechanical restraint, no restraint, and the use of spinal anesthesia and drugs such as curare. No method has yet proved completely successful. In spite of contradictory reports, the consensus of opinion appears to be that spinal fractures except for pain are relatively insignificant. Fractures of the long bones or of the pelvis are more serious complications. Since some of the femoral fractures are subcapital, talipes or patients having had previous irradiation of the femoral neck area should probably not receive shock therapy.

Easton and Sommers reviewed 800 cases treated by shock therapy to compare the incidence of fracture in those given pre-shock curare and those not so prepared. Of the entire group of patients 26.1 per cent incurred vertebral fractures and of the 275 who received curare 5.8 per cent had fractures of the spine. The highest incidence of fracture occurred in patients under 25 years of age which substantiated Blumenthal's assertion that the muscularity of the patient plays an important role in the causation of fractures. The fourth, fifth and sixth thoracic vertebrae were most frequently affected. Patients whose bones appeared osteoporotic before treatment had an incidence of fracture which was double that of those whose bone density was roentgenographically normal.

The authors' study was carried out at McLean Hospital, Waverly, Massachusetts from September 1940 through February 1946. In this period 230 patients received electroshock therapy ranging from one treatment to several series of treatments. The electric current was calculated to produce a convulsion of 45 seconds duration. Five trained attendants held the patient just enough to prevent sudden hyperflexion and to absorb the initial shock of the convulsion. Routine x rays of the thoracic and lumbar spine were taken before therapy and afterward if the patient complained of pain or had any objective findings suggestive of fracture.

Of the 230 patients studied 53, or 23 per cent sustained fracture of one or more bones including 110 vertebrae. The incidence of fracture was greater in males than in females, and in the young and the old rather than in the middle-aged.

Regardless of the method by which the convulsion is produced it would seem that its severity is a great factor in the number of fractures incurred as well as in their location. Certain pre-existing conditions of bone notably osteoporosis and malignancy ap-

pear to contraindicate shock therapy as they render bone much more susceptible to fracture.

FRANCES E. BRENNEMER, M.D.

Masern, L. The Histopathological Aspects of Koehler's Disease of the Metatarsal Bones (Sul quadro istopatologico della malattia metatarsale di Koehler). *Chir. org. movim.* 1946 30 302.

The author reports 2 personal cases of Koehler's disease in which the involved metatarsal bone was resected and studied. Numerous previous reports on the microscopic pathology have been presented in the past. The author believes that the differences are based purely on the stages of the disease at the time it was studied.

It is the author's opinion that the changes in the metatarsal heads are explainable on the basis of nutritional disturbance of the bone. In the pathological specimens there is edema of the tissues later followed by necrosis of the bone and cartilage. Impaired circulation due to trauma is probably the cause of the condition in most cases.

CARLO SCUDERI, M.D.

ORTHOPEDICS IN GENERAL

Bennett, R. L.: Convalescent Care of the Weak-ened Shoulder with Particular Reference to the Use of the Overhead Sling. *South. M. J.* 1947 40 120.

Weakness of the muscles of the shoulder girdle results from central and peripheral nerve lesions as well as traumatic lesions about the shoulder that result in disuse and limited mobility. Among the causes of muscular weakness are acute anterior poliomyelitis, polyneuropathy, Erb's palsy, brachial plexus injuries and other purely motor nerve conditions, fractures, dislocations, contusions, sprains, neuritis, tendonitis, fibrositis, the scalenus anticus syndrome and other local bony and soft tissue lesions.

Functional capacity depends upon 3 factors, namely range of motion, muscle group strength and coordination of muscle action. The articulations must have a free and painless range of motion.

Efforts to restore or maintain a functional range of motion to the shoulder must be started just as soon as the medical condition of the patient permits. At first all mobilization should be passive and as painless as possible. In repose the patient should rest on his back with a pillow holding the arm at about 40 degrees from the body, the elbow semiflexed and the forearm supinated.

As the acute phase subsides the patient is placed in a sitting position with the shoulder protected by a sling or by resting the extremity on a padded bed table. Recovery can be limited just as much by a persistently elevated position as by the unsupported weight of the arm.

As the convalescent phase gets under way a combination of passive and active assistive motion is started. This should be supervised by a trained physical therapist during 4 or 5 periods each day. Massive motion is given for 4 distinct reasons: (1) to

maintain or restore a normal range of motion in the shoulder girdle (2) to assist circulation (3) to maintain patient awareness of normal position and (4) to stimulate flexion and extension reflexes in the muscles making up the shoulder girdle.

The author has designed a special type of shoulder sling to aid in active assistive muscle re-education. This consists of a leather band attached to an ordinary screen door spring which hangs from a rigid right angled support made of a metal rod (3/4 inch), attached to the chair. With the elbow forearm and wrist supported in this apparatus at the desired height the patient is encouraged to carry out routine activities which should be supervised. Muscle re-education should also be carried out in the therapeutic pool. The shoulder ladder shoulder wheel, and overhead pulleys should be used to assist and encourage the use of the shoulder. Specially adapted looms and other forms of occupational therapy care fully supervised aid in the convalescence.

DANIEL H. LEVITZAL, M.D.

Loebard, P. The Syndrome of Post traumatic Muscular Hypertonia and Degenerative Neuritis. Volkmann's Syndrome (Le syndrome post-traumatique d'hypertonie musculaire et de démyélinisation nerveuse. Syndrome de Volkmann) *Rev. orthop. Par.* 946 3 35

In this article Volkmann's syndrome is discussed in the light of newly acquired knowledge regarding the tone of the striated muscles, their central origin, and also in the light of Barré's work which emphasizes the reactions in the spinal cord elicited by the injured extremities. Injuries have been considered to be strictly localized disorders. Leriche has described vasomotor sequelae caused by injuries and predicted their effects on the spinal cord. Barré proved Leriche's predictions to be correct.

The influences of fractures on the spinal cord have been described in detail, as well as the associated symptoms which often are overlooked. Pain is transmitted to the cerebral cortex and stimuli are sent peripherally by way of the sympathetics which cause vascular reactions differing in each individual. Some suffer a transitory functional general paraplegia which cannot be based simply on pain and disruption of the continuity in an extremity because it never occurs in classical fractures however it does occur in certain cases of soft tissue injuries. The real reason for the loss of motor power is the loss of the balance of muscular tone the disturbed balance of the antagonists and synergists. Muscle tone depends on neuromuscular fibrils located in the muscle substance, aponeuroses, tendons, synovium and peritendium.

These stimuli are transmitted not only to the motor neurons but also to centers located in the medulla oblongata, cerebellum and cerebrum. The neuromuscular fibrils form a fundamental part in the reflex arc the myotatic reflex of Laddell and Sherrington, which postulates that each passive stretching of a muscular fiber is followed by an immediate and vigorous contraction. Passive extension of a paralyzed

or anesthetized muscle increases its tension by only a few grams. A muscle provided with all its necessary innervation is able to maintain a tension of several kilos. The contraction of the passively extended muscle persists or decreases very slightly as long as the passive extension of the muscle is maintained. This reflex is a localized process and is part of the spinal reflex; it does not radiate to the adjacent muscles. In case of a fracture the muscle tone is disturbed because the muscles are kept in extension by the hematoma, by the angulation of the fragments, or by the forceful stretching at the time of the accident. The result is contracture of certain muscles.

The myotatic reflex is responsible for the difficulties often encountered in the reduction of fractures. General anesthesia is not sufficient to abolish this reflex. Local anesthesia is the best way of suppressing it. Many investigators have demonstrated that infiltration of muscle tissue with novocaine electrically paralyzes the receptors for the myotatic reflex and abolishes voluntary contractions and non-tonic reflexes. Spinal anesthesia works even better since it has an effect which is similar to sectioning of the posterior roots.

Following the first hours of hypertonia a state of hypotonia ensues when the muscle loses its volume, shape and power. Leriche and Albert have pointed out that every trauma is first a trauma of the vasomotor system. There always is also a reaction of the spinal cord. These processes are not confined to a single axis but affect the corresponding sympathetic centers and travel up and down the gray matter secondarily affecting the opposite leg or all four extremities. Every fracture therefore acts upon all of the nerve centers particularly the spinal cord and the motor and sympathetic centers, then it affects sensation and eventually the cerebral cortex.

A 12 year old female sustained a fracture of the humerus and showed a fully developed paralysis of the three nerves and a Volkmann type deformity of the arm. There was complete loss of sensation from the finger tips to the radiocarpal joint line. The fingers were cold and cyanotic. There was edema of the skin extending up to the midforearm. Novocaine was injected into the flexors and pronators near their origin and the musculotendinous junction. A few minutes later the contracture disappeared and less than half an hour later the wrist and fingers could be supinated and hyperextended. The corrected position was maintained by an appliance. Ten weeks later sensation began to reappear on the dorsal aspect of the hand. The forced pronation of the arm caused a disturbance of the muscle tone resulting in hypertonia which was eliminated by procaine infiltration in a few minutes.

In the light of these considerations Volkmann's syndrome has the following underlying symptoms:

Vascular spasm is undoubtedly present and is located high in the brachial artery. From this level it very often descends distally. It has been shown experimentally that the reflex causing the spasm passes through the spinal cord.

2 The examination of the musculature shows three different phenomena which are worth discussing. Muscles supplied by the radial nerve show hypotonia even after function of the radial nerve has returned. The author compares these findings with similar signs observed in lead poisoning. In the regions of the flexor and pronator muscles two reactions occur which cause the changes in these muscles. Injury to the motor nerves causes paralysis of this muscle group and at the height of this change a quantity of acetylcholine is liberated which acts on the sick fibers and causes hypertonia of these muscles. The neuromuscular manifestations are not of secondary but of primary importance in the causation of Volkmann's syndrome and the central origin of this condition cannot be ruled out. In severe cases there is always atrophy of the muscles in the hand especially of the interosseous group. There is always a sensory factor superimposed on the motor factor in the region of the hand. Although the motor paralysis of the hand never improves sensation usually returns completely to the hand.

Arterial spasm although prolonged, cannot explain the symptoms of degeneration of the nerves. The paralysis encountered in Volkmann's contracture is not of a peripheral type. In view of the changes in the hand the similarity to the Aran Duchenne syndrome which indicates anterior poliomyelitis is significant. There are cases of the Aran Duchenne syndrome which are due to the action of lead on the anterior horn cells of the spinal cord. It is suggested that the cause of Volkmann's syndrome might be found in the spinal cord. GROSSER L. REISS, M.D.

Pisani A. J.: Pathognomonic Sign for Cyst of the Knee Cartilage. *Arch. Surg.*, 1927 54 138.

The author has studied 31 cases of cyst of the semilunar cartilage of the knee either medial or lateral and has found that in all cases the cystic

mass was prominent on extension of the knee and disappeared on acute flexion.

VERNON C. TURNER, M.D.

Morandi, G.: Oscillometric Studies of Amputation Stumps (*Ricerche oscillometriche nei monconi d'amputazione*). *Chir. org. movim.* 1946, 30 389.

Of 17,074 amputation stumps observed by the author 441 (2.57%) were on the upper extremity and 1,333 (7.72%) on the lower extremity. Of the 441 stumps of the upper extremity, 280 (63.50%) were on the forearm and 161 (36.50%) on the upper arm. Of 1,333 stumps of the lower extremities 661 (72.09%) were on the lower leg and 372 (27.90%) on the thigh.

Of 300 patients selected for oscillometric studies 52 had undergone amputation because of a grave injury 103 because of infected wounds and 145 because of frozen extremities.

Oscillometric studies on the amputation stumps showed that the method allows a clinical observation of regressive lesions of the arteries in the stump. Quantitative as well as qualitative alterations of the oscillometric curves may be found, the curves may assume a flat shape and the diastolic excursions may be augmented.

Toxic infectious processes aggravate the anatomic changes in the involved artery not only in the stump but in the proximal, higher located segments.

Frostbite markedly diminishes the oscillations which may reach the zero level. Not only hemodynamic factors i.e. a diminished blood flow, but also lesions of the vascular wall caused by toxic infectious processes or congelation are responsible for the changes in oscillometric curves in amputation stumps. Muscular atrophy in the stump impairs the propulsive effect of the muscles on the blood and thus contributes to changes in oscillometric curves.

JOSEPH K. NARAT, M.D.

SURGERY OF THE BLOOD AND LYMPH SYSTEMS

BLOOD VESSELS

Ventura, R.: A Rare Lesion from a Flare Gun (Su un singolare caso di lesione da razzo) *Arch. Ital. Chir.* 1946 68 400

The author's patient accidentally shot himself in the left thigh with a flare gun, burning the tissues and producing hemorrhage. The extremity was cold, the popliteal pulsation was weak, and the dorsal pedal artery was not palpable. The wound was debrided under local anesthesia by means of a nerve block. On extension of the incision to the apex of Scarpa's triangle, there was a sudden gush of blood from a defect in the femoral artery which was controlled by means of a fine silk suture impregnated with oiled vaseline. Muscle was sutured over the vessel, and a sulfonamide was used locally. Several days later the patient developed a fever showing evidence of infection in the wound. The wound was drained, only to start bleeding again. It was then reopened and the bleeding point of the femoral artery was ligated with catgut. Several days later hemorrhage recurred and ligation was again carried out.

The probable cause of secondary hemorrhage in this case may have been necrosis of the area from the ligatures, or an injury about the artery and its wall from the heat, which resulted in an aneurysm due to the intra-arterial pressure and finally rupture of the aneurysm.

Whenever possible suture of a blood vessel should be done instead of ligation, for pressure is greater in a ligated vessel than in a vessel with continuity.

ARTHUR F. CROSSLAND, M.D.

Freeman, N. E., and Storck, A. H.: Successful Suture of the Abdominal Aorta for Arteriovenous Fistula. *Surgery* 1947 63.

Arteriovenous fistula involving the abdominal aorta and vena cava is rare since patients generally succumb to the initial massive hemorrhage. If the patient recovers from the initial loss of blood, the short circuiting immediately places such a strain on the heart that early cardiac failure occurs. The first successful repair of such a fistula was recently reported by Pemberton et al (*Ann. Surg.* 1946 3:580). Freeman and Storck report a second case with a successful operative repair.

The patient received a perforating wound from a .25 caliber bullet which entered the abdomen 3 inches below the ensiform cartilage just to the right of the midline and emerged through the back at the level of the second lumbar vertebra. He was immediately paralyzed below the waist. On the day of injury a laparotomy was performed and 14 days later a laminectomy was done. Following the second operation there was considerable return of function in the lower extremities.

A pulsating mass with intense thrill was discovered in the upper abdomen 6 weeks after the original injury. Some dilated veins over the abdominal wall were observed. The heart was not enlarged although the pulse rate was 96. The blood pressure was 152/96. The lungs were clear and the liver normal in size.

Four months after the original injury there was a sudden increase in the size of the mass associated with abdominal discomfort and vomiting, and the thrill became more apparent. Accordingly operation was undertaken 12 days later.

A transperitoneal approach to the aneurysm through a right upper paramedian incision was attempted at first but was unsuccessful because of the presence of dilated veins over the anterior surface of the aorta. The peritoneum and transversalis fascia were then incised from within the abdomen just to the left of the midline to expose the anterior surface of the psoas muscle and the vertebral column. By the latter approach it was possible to place temporary tourniquets above and below the aneurysm as well as about the left renal artery. The aorta was cut away from the aneurysm. A large sac was found to intervene between the aorta and the vena cava. The opening in the aorta was closed by a transverse running stitch.

When the aorta was first occluded the blood pressure rose from 118/70 to 140/100 and the pulse went from 130 to 160. The tourniquet was left in place for 1 hour and 40 minutes. Upon release of the rubber tubing the systolic pressure dropped to 5, but within a half hour rose to 110/80. Postoperatively there was severe oliguria for almost a week and mild hypertension for a week, with retinal vasospasm. At the end of 8 months the patient showed no evidence of recurrence of the fistula.

The authors point out that the absence of cardiac hypertrophy in this case was probably the result of the position of a large aneurysmal sac between the compound vessels. The aneurysm lay behind the vena cava and so compressed it that the return flow of blood to the heart was hindered. The dilatation of the superficial veins over the abdomen was in keeping with that explanation.

THEODORE B. MARSHALL, M.D.

De Takata, G., and Reynolds, J. T.: The Surgical Treatment of Aneurysms of the Abdominal Aorta. *Surgery* 1947 2:443.

Although 500 cases of aneurysm of the abdominal aorta have been reported in the literature, only 30 of them have had surgical ligation, and of the 30 patients only 6 have survived the procedure for longer than a year. Wiring of abdominal aneurysms has been practiced for many years, but the authors noted a death in follow up material in the cases subjected to this technique. Aneurysmorrhaphy is

the third method reported useful in the treatment of these aneurysms

The authors report, in some detail 8 cases of aneurysm of the abdominal aorta 6 of which were subjected to surgical exploration. Of these 6 only 4 were deemed operable and 1 of these was wired the remaining 3 had bands of cellophane wrapped about the aorta proximal to the aneurysm and, in 1 case, the aneurysmal sac was reinforced with cellophane. Only the patients treated with cellophane banding survived for any length of time 1 living 14 months the second 8 months and the third 2 years.

The authors believe that cellophane banding is a most useful method of dealing with aneurysms in hypertensive and syphilitic groups as it provides a gradual occlusion by fibrosis stimulated by an ingredient in some types of cellophane

EDWARD H. CAMP, M.D.

BLOOD TRANSFUSION

Hustin, A., and Rémy, R.: Influence of the Sex of the Donors and the Recipients on the Frequency and the Gravity of Transfusion Reactions (*Influence du sexe des donneurs et des récepteurs sur la fréquence et la gravité des incidents survenant au cours des transfusions sanguines*) *Presse méd.*, 1946, 54, 738.

A study of the reactions was made in 864 transfusions of citrated blood given at the Transfusion Center of the University Hospital in Brussels during the year 1942. There was a correlation of the incidence of reaction with the sex of the donor and recipient

There were reactions in 5.3 per cent of 206 cases in which both the donor and the recipient were males. When both the donor and recipient were females (202 cases) the reaction rate was 17.3 per cent. There were 219 transfusions in which the donor was male and the recipient female and 237 in which the donor was female and the recipient male. Reactions in these two groups occurred in 9.1 per cent and 6.3 per cent respectively.

Further analyses were made to determine the occurrence of the different types of reactions and the relation to the conditions for which the transfusions were given. The sex distribution of untoward reactions maintained essentially the same relative position in the more detailed analyses.

The authors conclude that the combination of female donor and female recipient is too hazardous.

Since the elimination of female donors is not feasible they conclude that the best procedure is to combine donors and recipients of opposite sexes.

THEODORE B. MARSHALL, M.D.

Zukerman, C. M.: Fatality in a Blood Donor. A Case Report with a Review of the Literature. *Ann. Int. M.* 1947, 26, 603.

The American Red Cross through its Blood Donor Center, collected approximately 13 million pints of blood during the period between 1941 and 1945. At the Chicago Blood Donor Center approximately 640,000 pints of blood were collected in the 3½ years of its operation. Despite careful checking and examination of donors there was one fatality in a blood donor. A white male following removal of 500 c.c. of blood, had a small watery emesis a few minutes after venesection. He was given 1/100 gr. of atropine sulfate. The blood pressure was 90/60, and the pulse was 78 per minute. He complained at the sudden onset of a slight substernal pressure without radiation gasped several times, and died. An autopsy was performed and the anatomic diagnosis was

Thrombotic occlusion of the right coronary artery marked coronary sclerosis with narrowing of both the left descending and the right coronary arteries focal fibrosis of posterior wall of right ventricle, edema of the lungs and acute passive congestion of the liver spleen, and kidneys.

Since a possible contributing factor in coronary occlusion may be the slowing of the systemic circulation, and since the coronary flow is regulated by the mean level of the arterial pressure, especially diastolic, any marked fall in blood pressure may act as a precipitating cause of coronary thrombosis. Approximately 6 per cent of the blood donors at the Chicago Blood Donor Center developed a systemic reaction varying from slight to marked pallor weakness faintness sweating nausea, and vomiting with a transient drop in blood pressure. In the presence of coronary sclerosis there is a tendency to hypersensitivity of the vagal type of carotid sinus reflex. Masters felt that regardless of whether coronary thrombosis took place on an arteriosclerotic basis, or as a result of hemorrhage into a plaque, it could be attributable to alterations in the coronary circulation.

A review of the literature reveals that the reported causes of death in blood donors were either air embolism or cardiovascular lesions such as coronary thrombosis, cerebral hemorrhage, or other arterial emboli.

LEROT J. KLEINSMAN, M.D.

SURGICAL TECHNIQUE

OPERATIVE SURGERY AND TECHNIQUE; POSTOPERATIVE TREATMENT

Harwood, H. B.: *Bronchoscopy in Postoperative Complications. Austral N Zealand J Surg* 947 16 1947

Many postoperative pulmonary complications follow bronchial obstruction and result in atelectasis or pneumonia. Such obstruction is usually due to a plug of mucus, but it is sometimes caused by a foreign body or an undiagnosed tumor. In cases in which the cough and laryngeal reflexes are depressed by lowered vitality or narcotics, the respiratory tract is more vulnerable and coughing may be incapable of clearing the bronchial tree. When patients are propped upright in bed they may become exhausted by unsuccessful efforts to cough sticky or copious sputum uphill; also pain in the wound on coughing or deep breathing may discourage efforts to clear the sputum. These complications may follow local as well as general anesthesia as their cause lies in the type of patient rather than the type of anesthesia.

At times urgent operations must be done in the presence of respiratory infections and occasionally operations of election may not be sufficiently long delayed after such infections. Some of the complications following such procedures may be avoided by immediate postoperative precautions. At the Royal Prince Alfred Hospital Sydney Australia, frequent sinus operations are performed on bronchiectatic patients under intratracheal ether anesthesia. In these cases bronchoscopic lavage is done on the day before operation and at the end of the procedure in this manner postoperative flare-ups and complications are prevented. The anesthetist can frequently prevent trouble by aspirating the pharynx and bronchial tree when he is aware of excess moisture in the respiratory tract.

The symptoms of retained bronchial secretions, which may come on suddenly are moist cough after expectoration, rales and rhonchi at the lung bases, progressive dyspnea, elevation of temperature, pulse, and respiration. Cyanosis may be present and occasionally there is pain in the chest. X-ray examinations may reveal hypoventilation, atelectasis or bronchial pneumonia. One should not be reluctant to move the patient for roentgenography as this movement may be sufficient to relieve the obstruction.

Most cases of obstruction will be cleared by deep breathing posturing, handclapping over the affected area, movement of the patient and the use of carbon dioxide. The use of morphine and wound support while the patient is encouraged to cough will help. If these conservative means fail, then bronchoscopic aspiration should be immediately considered. This procedure can be carried out in bed and in the ward. Premedication may be given and the procedure may be carried out under local anesthesia, obtained by

spraying the respiratory tract. The patient may be placed in semi Fowler position, or he may lie diagonally across the bed with the head to the right for the left lung and to the left for the right lung. After passage of the bronchoscope secretions are aspirated if these are sticky; lavage with 5 c.c. of saline is done. Relief is usually immediate and rarely has to be repeated.

If patients are not treated as indicated, lung abscess and bronchiectasis may develop. The author has seen this occur in a number of cases when persistent cough was not noted after postoperative pneumonia had subsided. He reports the case of one such patient who developed a sacular bronchiectasis and who is symptomatically improved by continued bronchoscopic lavage.

The author reports another case of a patient who developed bronchiectasis after a piece of rubber from a mouth gag lodged in the bronchus during operation. Four cases are reported of patients who made uneventful recoveries when these complications were recognized early and bronchoscopy was immediately instituted.

ROBERT MAYO TYKERT M.D.

Cummins, H. A Preliminary Note on a Study of Postoperative Thrombosis, with Special Reference to a Prethrombotic State. *Austral N Zealand J Surg* 1947 6:197

There is little doubt that the treatment of postoperative venous thrombosis with anticoagulants combined with surgical ligation in selected cases produces excellent results when the lesions are symptomatic; however investigation is now being directed toward criteria for recognition of the lesions before symptoms are produced. The history of previous attacks, familial incidence or varicose veins may be warning signs. Operations on the lower limbs and peritoneal cavity, long deep anesthesia and postoperative immobilization with the legs over pillows, all predispose to the complications. An unexplained elevation of the pulse or temperature are suspicious. The patient may complain of vague discomfort or pain in the thighs or calves for some time prior to the onset of thrombosis.

In the department of urology at the Royal Prince Alfred Hospital, Sydney Australia the author has carried out regular postoperative coagulation times on 80 patients undergoing major surgery. This investigation has largely substantiated Bergquist who suggested that a "prethrombotic state exists for some hours before the onset of signs or symptoms. Bergquist claimed that a coagulation time of around 3 minutes was characteristic. The author states that his present work suggests that the danger level may well be 4 minutes rather than 3 and he stresses that it is significant only when maintained at this level for several hours. Postoperative graphing of the reading was done

A total of 7 of the 80 patients studied had thrombotic incidents in all of these the "prethrombotic" period was quite distinct, and the patients were treated successfully with heparin. One other patient was presented who had a history of two previous thrombotic incidents and who developed a coagulation time of 3 minutes on the seventh postoperative day. This patient was treated with heparin the level returned to normal and no symptoms developed.

ROBERT MATO TERRY, M.D.

Portes, L., Varangot, J., and Vassy, S.: The Treatment of 50 Venous Thromboses in Women with Dicoumarol. End Results (Résultats obtenus par l'emploi de dicoumarol dans le traitement de 50 thromboses veineuses chez la femme). *Presse méd.* 1947 55 57

The pathogenesis of thrombosis has been a matter of controversy for many years. Today most authors agree that a dual mechanism, the action of a pathogenic organism or its toxin on the venous endothelium and a blood dyscrasia, are involved. In fact there is a reciprocal relationship between infection and the constitution of the blood. An example of this is the increased fibrinogen in pyrexias or following operation.

The majority of thromboses are classified between the extremes of strictly infectious and humoral. If one concedes that thrombosis is determined by upsetting the equilibrium between physiological coagulants and anticoagulants in the direction of hypercoagulation one must also concede that an upset in the opposite direction will prevent the occurrence and extension of a thrombosis. Two drugs, dicoumarol and heparin, have been shown to be therapeutically useful as anticoagulants. Dicoumarol is believed to delay coagulation by preventing the synthesis of prothrombin from vitamin K in the liver. Since there is no absolute correlation between the dosage of dicoumarol and the increase in prothrombin time, most authors advocate repeated determinations in regulating dosage. Since the action of dicoumarol occurs from 24 to 48 hours following its administration, heparin is added to it initially to counteract this delay. Following extensive animal experimentation the authors used the treatment clinically.

The authors agree with the English literature in that the systematic use of the drug for prophylaxis is to be condemned especially in preoperative or prepartum patients. They advocate use of the drug in cases of already established thrombosis to prevent extension and accelerate resorption by preventing further coagulation. To be successful adequate treatment must be started as soon as a thrombosis begins to develop.

In order for treatment to be effective, frequent prothrombin determinations should be done so that the level can be maintained between 20 and 40 per cent. This should be continued up to the eighth day following mobilization of the patient. While treatment must be adequate hemorrhages from the nose

gastrointestinal and genitourinary tracts or wound will result from too great a drop in the prothrombin level. One mild case occurred in the authors' series of 70 cases. It was treated with repeated whole blood transfusions.

In the usual plan of treatment an initial dose of 300 mgm. was given on the first day, then 200 mgm. on the second day and 100 mgm. on the third day. Daily prothrombin determinations were made. The desired level between 20 and 40 per cent was usually reached in 48 hours. When the prothrombin level reached 50 per cent which may occur between the fifth and ninth days, 300 mgm. of dicoumarol were given immediately and 200 mgm. on the following day. Finally if the prothrombin level reached 80 per cent, the initial dosages were repeated.

The criterion of cure adopted by the authors was the complete disappearance of edema as determined by comparative measurement of the two limbs at 6 fixed levels.

The insidious phlebitis cases were deliberately omitted from the series, as well as those cases in which the early initiation of the treatment aborted the phlebotic process. The authors then reported 50 cases of venous thromboses already established at the time treatment was instituted. 45 were cases of phlebitis and 5 of periphlebitis. Three of the patients had had emboli. In 2 the emboli occurred prior to the phlebitis and before treatment was begun. The third embolism (a mild case) occurred while the patient was under treatment. In this patient the desired decrease in prothrombin was never reached.

There were only insignificant sequelae in the patients seen after the phlebitis had completely subsided. In a few instances, a mild edema occurred at the end of the day. The late results were excellent. The average duration of the disease in the 50 cases was 183 days. No severe complications or fatalities attributable to the disease itself or to the treatment have been recorded by the authors.

GERARD GAGNON, M.D.

Evans, J. A. and Boller, R. J.: The Prevention of Postoperative Pulmonary Embolism. *N. Eng. J. Med.* 1947 236 392

During the past 8 years venous section and ligation and anticoagulant therapy by heparin or dicoumarol or a combination of these anticoagulants have been developed in the treatment of venous thrombosis and pulmonary embolism.

There are definite indications for both procedures. When laboratory and clinical experience in the use of dicoumarol is lacking femoral ligation is the method of choice.

At the Lahey Clinic femoral ligations are with few exceptions, limited to patients with venous thrombosis who must soon have a second stage operation to those with conditions such as hemorrhagic colitis, those with poor liver function and to those with ambulatory recurrence of phlebotrombosis with pulmonary embolism. If there is any venous thrombosis the present method of anticoagulant therapy is

to start immediately with both heparin, in Pitkin's menstruum and dicoumarol. A single dose of heparin prolongs the coagulation time before 2 hours have passed and protects the patient until a two-day latent period of dicoumarol action has elapsed by which time the prothrombin content has usually dropped. In the patient resistant to dicoumarol the injections of heparin are continued every second day.

Between January 1, 1945 and January 1, 1946 anticoagulant therapy was administered to 127 patients with postoperative venous thrombosis with or without benign pulmonary embolism, with death of only 2 patients. After January 1, 1946 another death occurred.

This record compares favorably with the results obtained by others with venous ligation and section for the prevention of pulmonary embolism.

Fifty-two sudden, unrecognized, or untreated fatal cases of pulmonary embolism occurring from 1940 to 1946 are analyzed. 48 of the fatalities occurred postoperatively. In 8 cases thrombosis and embolism had been recognized and the patient was treated. Two deaths occurred in patients with medical cardiac conditions, in one patient, preoperatively. Autopsy was performed in 21 cases.

Prophylactic exercises are suggested for the prevention of pulmonary embolism—such as wiggling of the feet a thousand times a day.

Death according to age and sex, was as follows: 17 patients were between the ages of 51 and 60 years, 14 were in the seventh and 1 were in the fifth decade. 33 of the patients were men and 19 were women. Twenty-seven patients had had surgery on the colon or in the pelvis, cranial operations had been performed in 3 cases, and splenectomy in 1 case.

Previous vein conditions may predispose to venous thrombosis.

In 25 patients the greatest liability to the first pulmonary embolism was from the sixth to the sixteenth postoperative day. In 11 patients, before the sixth day and in 12 after the sixteenth day.

The signs and symptoms frequently associated with pulmonary embolism are elevated temperature, circulatory collapse, dyspnea, tachycardia, cyanosis, and chest pain. Elevation of temperature and tachycardia are the more important warning signs.

Twenty-two patients died within an hour after the first symptoms, 20 died in from 2 to 24 hours, and 10 patients died more than 24 hours after the first signs of thrombosis and embolism. The courses of some of these cases are reviewed.

The authors state that routine postoperative examination of the legs for any evidence of phlebotrombosis should be carried out after all major surgical operations. This should consist of questioning the patient as to the presence of pain in legs, especially in the calf muscles. Even when a negative reply is given, the calf should be tested for tender ness, and an attempt made to elicit Homans' sign.

Forty-four of 52 patients gave warning of thrombotic processes, which means that in 85 per cent of the cases death from pulmonary embolism might

have been prevented if the warning signs had been appreciated and prophylactic measures undertaken.

GEORGE W. RICHARDSON, M.D.

ANTISEPTIC SURGERY TREATMENT OF WOUNDS AND INFECTIONS

Berman, J. K., Pierce, G. S., and Best, M. M.: Burn Shock: Its Treatment with Continuous Hypodermoclysis of Isotonic Solution of Sodium Chloride into the Burned Areas; Clinical Studies in 2 Cases. *Arch. Surg.* 946, 55-571.

The present paper is predicated on the experimental work of Berman, Peterson, and Butler reported in *Surgery Gynecology and Obstetrics* 1944, 78: 337-345 and the recent experience of applying these conclusions to two severely burned patients. The significant facts in the experimental work were that (1) there is a loss of water and electrolytes, chiefly salt, followed by plasma proteins into the burned area. (2) this loss continues until pressure in the tissue spaces equals the hydrostatic pressure in the capillaries, when reabsorption begins. (3) reabsorption occurs in a reverse manner, the lymphatics, behaving as semi-permeable membranes, return the colloids, then the capillaries absorb the crystalloids. (4) the loss of plasma occurs earlier in the more severe, than in the less severe burns. (5) treatment by hypodermoclysis of isotonic sodium chloride solution into the burned areas seems to decrease the amount of water and plasma lost and facilitates absorption of both. (6) it is thus an autotransfusion of lost colloids and crystalloids and in addition, is a method of supplying quickly the great demand for salt by injured tissues. (7) it makes possible the dilution and excretion of hypothetical toxins, helps to control body temperature, and prevents pulmonary edema and anuria. (8) human skin is not as loosely attached to the subcutaneous tissue as is that of the dog and therefore multiple injections would be necessary but the volume of solution would be less to produce intracellular pressure above that of effective capillary pressure.

The patients reported were severely burned following the explosion of a large tank filled with steaming hot sodium hydroxide. The burns were extensive involving 72 per cent and 71 per cent, respectively of the body surface and were second and third degree in type. Prior to hospitalization both of the patients had received 3/4 gr. of morphine sulfate subcutaneously and 500 c.c. of citrated blood plasma intravenously. Neither appeared to be in shock but because of pain apprehension and the complaint of severe coldness both patients were given morphine sulfate, 3/4 gr., intravenously. Isotonic sodium chloride solution was injected by hypodermoclysis into the burned areas by continuous drip. The needles were moved to various parts of the body. All burned areas being kept distended. The infusions were used continuously for 96 hours in amounts of 3,000 to 4,000 c.c. in 24 hours. Enteric coated sodium chloride tablets were given but were discontinued after

the first day because they caused nausea and vomiting. Tetanus antitoxin 1,500 units was administered and penicillin, 30,000 units was injected intramuscularly every 3 hours. A bland high protein diet, morphine for pain and enemas of isotonic salt solution as needed were ordered. 500 c.c. of whole blood were given each day for the first 3 days.

On the third day almost the entire subcutaneous space of the body, especially the trunk, was greatly distended with fluid. The infusions were discontinued on the fourth day. On the seventh day all areas were covered with dressings of isotonic sodium chloride solution and penicillin solution (200 units per cubic centimeter) except the fingers and toes which were separated with petrolatum gauze. The necrotic areas were loosened daily and this was facilitated by the infusions.

On the seventeenth day the first patient began to show a picture of sepsis and toxicity with laboratory results as follows: nonprotein nitrogen 28 mgm, carbon dioxide combining power 59.7 volumes per cent, plasma protein 4.65 gm., with 1.0 gm. albumin and 3.65 gm. globulin, a hematocrit reading of 43.5 volumes per cent, and leucocytes 16,350. Penicillin was increased to 50,000 units every 3 hours. Cold sponges of the face and anterior trunk were carried out frequently and the patient was placed in an oxygen tent. Delirium became worse, incontinence ensued and the patient refused food and water. Isotonic sodium chloride solution infusions were restarted and a transfusion of 1,000 c.c. of whole blood was given. The patient was transfused again on the thirty-fifth and thirty-eighth days. At this time the carbon dioxide combining power was 102. The wounds were clean, the entire back (the site of second degree burn) was healed, the face and neck had healed and the thighs, legs, and arms were healing rapidly. The urinary output was adequate: 1,500 c.c. with an intake of 3,500 c.c. and the urine was acid in spite of a carbon dioxide combining power of 114 volumes per cent. On the thirty-ninth day the patient was moribund, the nonprotein nitrogen was 26 mgm. the urine strongly alkaline, muscular twitchings were evident which later passed into clonic convulsions, respiration became labored, cyanosis developed, the patient lapsed into coma, and died the fortieth day after admission.

The significant findings at postmortem examination were as follows: "The peritoneal cavity contained about 100 c.c. of clear light yellow fluid, an equal amount of the same type of fluid was present in each side of the chest and about 35 c.c. were found in the pericardium. The cardiac muscle was edematous, with small scattered accumulations of lymphocytes. There was no pulmonary edema. The spleen was large weighing 240 gm. and engorged with blood. The liver showed extensive fatty infiltration and degeneration. Large areas showed total destruction of the parenchymal cells of the liver. The kidneys were swollen, and all their blood vessels were dilated and filled with red blood cells. The tubules contained refractile droplets as seen in nephrosis. Glomeruli

and Bowman's capsules showed little deviation from normal, however, the former were dilated and filled with red blood cells. The cerebrum was edematous. In some areas this was extreme. Here the blood vessels had shriveled and retracted and surrounding them there were small areas of advanced autolysis. Ganglion cells were pyknotic and degenerated in such areas. The cerebellum showed practically the same picture as the cerebrum. The adrenals contained areas of fatty degeneration and hemorrhagic extravasation chiefly in the medullary zone.

The pathologic diagnosis was (1) edema of the cardiac muscle and acute myocarditis, (2) acute peribronchiolar pneumonia, hemorrhagic phase, (3) fatty infiltration of the liver and toxic atrophy of the liver, (4) acute nephrosis and chronic passive congestion of the kidneys and (5) massive autolysis of the cerebrum with cerebral edema.

The second patient also had a turning point which occurred on the nineteenth day. His temperature rose to 103 F orally, he became confused, had hallucinations and illusions interspersed with periods of stupor. These were followed by generalized muscular twitchings which at times became gross tonic and clonic convulsions. There was some cyanosis and the patient refused food and water. Hypodermoclysis of normal saline solution was started again, 500 c.c. of whole blood was given. He was placed in an oxygen tent and given sodium amytal as required to control convulsions. Practically all second degree burns had healed and some third degree burns were ready for grafts. Open wounds were covered with packs of normal saline. An isotonic solution of sodium chloride was injected beneath the burns sufficient to cause slight weeping. This was done once a day. Sloughs were removed each day as they became loose and this was facilitated by the injections of the sodium chloride solution. On the twenty-ninth day the infusions were stopped. He was given a high protein regular diet and a vitamin B complex. He was able to sit on the edge of the bed on the thirty-seventh day and was discharged on the fifty-fifth day.

In view of the experimental work and the experience with these human cases the authors strongly recommend that the method be studied further in the human, that resistance to infection be increased, and healthy granulation tissue stimulated.

EDWIN W. PARABELLI, M.D.

Sulzberger, M. B., Kanof, A., and Baer, R. L.: Studies on the Acid Debridement of Burns. *Ann. Surg.* 1947 125 418.

It is generally agreed that the early removal of nonviable tissue or slough from third degree burns is desirable and that methods of removing the slough should be as gentle and nondamaging as possible as well as "selective" in that while nonviable tissue is removed all viable elements are left unharmed.

A study was devised to determine the most suitable methods of removing nonviable tissue from burned areas. Two symmetrically situated areas on the flexor surface of each forearm were burned in human

subjects. The burns were approximately 4 by 3 cm in size, and histologic examination showed the areas were largely third degree burns but occasionally islands of intact epithelial elements remained. The burns were produced by applying to the skin a round copper disc, 1 cm. in diameter and heated to a temperature of 67° C. for 60 seconds. The heat was kept constant by methanol heated to boiling in the bottom of the apparatus by a continuous electrical current. No pressure was used except that exerted by the weight of the applicator itself. Usually the debriding applications were begun on the third, fourth or fifth day after the receipt of the thermal burn. The medication used was applied in an identical manner. Approximately 10 c.c. of the medication tested were applied to one of the lesions and covered with a 3 by 3 in. square of gauze, which in turn was then covered by several layers of vaselined gauze. Over this dry elastoplast. The agent was applied daily or until further applications had to be discontinued because of a prohibitive degree of irritation. On the average, debridement took a total of 4 or 5 days for the burn. When the debriding agent was discontinued both cent sulfonamide cream which was applied daily until healing was complete.

The results indicated that 0.9 per cent of pyruvic acid starch paste was more effective than plain starch paste in producing complete and rapid slough removal and therefore, in accelerating healing. Treatment with pyruvic acid starch paste produced more rapid healing than leaving the lesions untreated, treatment under pressure bandage with 5 per cent sodium sulfadiazine cream, treatment with 5 per cent sulfadiazine cream or treatment with 5 per cent silver nitrate in petrolatum. The results obtained from treatment with other acids and gels indicate that the effects of acid debridement are not specific for pyruvic acid. Acid debridement appears to be dependent on the maintenance of the correct supply of hydrogen ions over a sufficient period of time. Among the other acids tested 0.1 molar phosphoric acid (which has a p_H of 2.0 and is a weakly dissociated acid) proved to be the best from all viewpoints. It was approximately as effective in slough removal and in accelerating healing as was 0.1 molar pyruvic acid and 0.1 molar phosphoric acid in methyl cellulose water gel or in K-Y jelly. It was demonstrated that certain forms of dry hygroscopic powders containing the acids could be prepared which on the addition of water would rapidly form suitable gels. These proved to be less friable and almost as effective as pyruvic acid starch paste in removing slough and promoting healing of chemical and thermal burns.

FRANK F. KANTRAK, M.D.

Sellers, E. A., and Best, C. H.: Effects of Diets on Nitrogen Loss in Urine after Burns. *Bull. N.Y.S.* 1947: 132.

After burns or other injuries the urinary excretion of nitrogen may be definitely increased. Previous

investigations have indicated that the extent and depth of burning affect the amount and type of nitrogenous material excreted. Large amounts of protein must be administered after extensive burns if nitrogen equilibrium is to be maintained. Croft and Peters reported that the increase in nitrogen loss after burning could be reduced substantially by giving methionine or a protein supplement, to rats maintained on a moderate or low protein diet. This observation has been checked by the present authors and confirmed only in part. Young female rats weighing between 100 and 150 gm. were placed on a diet of 15 gm. of fox chow a day until a moderately constant urinary output of nitrogen was secured. This usually occurred in from 10 to 14 days. Under ether anesthesia they were then subjected for a period of 30 seconds to water at 85° C. in order to produce a burn of the back amounting to about one third of the surface area. On the day of the burn and daily thereafter a buffered solution of methionine equal to 1 per cent of the diet was injected subcutaneously into 6 of the 9 rats used in the experiment. Urinary nitrogen estimations were made at 48 hour intervals for 10 days after the burning.

The following conclusions were drawn:

1. Methionine supplement (1%) to a stock diet did not reduce the urinary loss of nitrogen after burning.

2. When a methionine deficiency existed in the basal diet of young rats however a supplement of methionine lowered the nitrogen excretion. Cystine plus an adequate choline intake was ineffective in reducing the nitrogen loss in young rats.

3. A lysine supplement added to a lysine deficient diet was also ineffective.

The experimental basis for the use of methionine in the treatment of burns would therefore appear to be limited to the finding that methionine is effective in young animals receiving a diet very low in this amino acid. With a more extensive injury the beneficial effect of giving this amino acid to adult animals might be revealed.

FRANK F. KANTRAK, M.D.

Langlois, J. L., Owen, C. R., and Cope, O. I.: Bacteriologic Study of Burn Wounds. *Ann. Surg.* 1947: 545.

Flourishing contaminating bacteria in a burn wound are a deterrent to the healing of the wound. The control of these organisms has been attempted by many methods. Solvents such as Dakin's solution, coagulating chemicals, and the more selective vital dyes have been applied to the wound surface but in their toxicity to bacterial growth they have proved damaging to the viable cells. The sulfonamides applied locally do not damage viable cells, but as they are limited to antistreptococcal specificity they have failed to block the development of other bacterial species in the wound. Attempts to control less susceptible organisms by increasing the local concentration of sulfonamide are prohibited because of the rapid absorption of sulfonamide from the wound surface which causes a rise in concentration of the drug to toxic levels in the body fluids and renal

failure. Systemically administered sulfonamide has the same limit of toxicity and is successful in controlling only the invasive infection of the streptococcus. It was hoped that penicillin would succeed where the sulfonamides had failed because of its wider antibacterial properties and virtual lack of toxicity. Studies were devised to demonstrate the nature of the bacterial contamination found in partial and full thickness burns in patients treated with either penicillin or sulfadiazine.

On entry to the hospital each patient was placed in an isolated room where every precaution was taken to avoid further contamination. The burn wounds were then covered without débridement or cleansing with a dressing of petrolatum gauze, thick dry cotton and an elastic bandage or towel. Subsequent changes of dressing were made in an operating room under aseptic precautions. The burns were arbitrarily divided into areas or wounds, and cultures were taken of each wound on admission and at each subsequent change of dressing until healing occurred. Isolation and identification of all morphologic types seen microscopically was attempted. Fifty-four patients were observed under systemic penicillin therapy and 38 under systemic sulfadiazine therapy. No patients were observed for any length of time who did not receive either form of chemotherapy. The penicillin dosage was low in the first cases (100,000 units or less per day) and high in the later cases (from 250,000 to 500,000 units per day). The dosage of sulfadiazine was regulated by the blood level of the drug and was maintained between 6 and 12 mgm./per cent. Cultures were obtained once a week from nearly all of the wounds.

It was evident that neither sulfadiazine nor penicillin exerted more than a limited control over the growth of bacteria in the deep burn wound and the number of strains multiplied in the absence of chemotherapy. Multiplication did not occur with sulfadiazine therapy and the number of strains slowly decreased during penicillin therapy. Resistance to penicillin developed rapidly however and avirulent forms were replaced by virulent bacteria. No beta streptococci were recovered on the day of injury from the full thickness burn wounds of patients subsequently treated with penicillin. There was more prompt elimination of the beta hemolytic streptococcus by penicillin than by sulfadiazine from those wounds in which this organism was encountered. This was presumably due to the observed inability of the beta hemolytic streptococcus to develop resistance to penicillin. The alpha and gamma streptococci slowly disappeared from the wounds of patients treated with sulfadiazine. In the wounds of the penicillin treated patients, in contrast, these streptococci grew until by the eighth week 90 per cent of all the unhealed wounds contained an alpha strain and a majority of the remainder a gamma strain and a few contained both. These two streptococci were found to develop resistance to penicillin rapidly.

Wounds of the buttocks, thighs and legs showed the greatest contamination and the highest incidence

of clostridia and the gamma or fecal type of streptococcus. Wounds of the head and neck revealed the least contamination, with no gamma streptococci and but few clostridia. The degree of contamination of the wounds of the upper extremities lay midway between the degrees of contamination of the other two body areas. It is suggested that clostridial antitoxin be considered in addition to tetanus antitoxin and prompt excision of slough be done in the therapy of patients with full thickness wounds of the lower extremity.

The rapid development of resistance to penicillin by the previously sensitive staphylococci and streptococci and the profusion of penicillin inhibiting and insensitive gram negative bacilli indicate that the effective period of penicillin therapy is sharply limited to the first 3 weeks. Six weeks after injury the wounds have become a bacterial quagmire.

The infection of burns is a problem of deep burns. The fight against it combines prevention of contamination, starvation of the bacteria by prompt excision of slough, an attack with penicillin, streptomycin, and sulfadiazine, and bolstering of the immune processes of the host by restoration and maintenance of physiologic balance of the patient.

FRANK F. KANTHAKE, M.D.

North, J. P.: Clostridial Wound Infections and Gas Gangrene. *Surgery* 1947 21: 364.

This paper is based on the author's experience with clostridial wound infections treated in an Army hospital in the North Burma Theater. The loss of life and limb which results from delay in the correct diagnosis of this infection is a challenge which can be met only by maintaining a constant rather than a sporadic interest in this disease. The distinction should be clearly made between the more or less localized clostridial infections, which have an excellent prognosis with conservative surgical management, on the one hand, and a true gas gangrene, which is a diffuse disease carrying an immediate threat to life and urgently demanding radical surgery. The author emphasizes that the adequacy of the arterial circulation is the factor which determines which of these two types of clostridial infection will result.

The incidence of this infection during the first World War in wounds of the soft tissues was 10.8 per 1,000 cases, and in wounds with compound fractures 63 per 1,000 cases. While the final figures are not available for the incidence of this infection during the second World War, isolated reports from the various theaters show the incidence of infection in soft tissue wounds was 6 per 1,000 cases and in wounds with compound fractures, 17 per 1,000 cases.

If the principal arterial trunk of an injured extremity is intact, the clostridial infection may be expected to localize, and, conversely, in the presence of injury to the main arterial supply the clostridial infection may be diffuse and gas gangrene may result. In the author's cases, to his certain knowledge 73 per cent, and probably 100 per cent, of patients with gas gan-

grene had major vascular damage of the 37 patients with a localized clostridial infection, only 3 had vascular damage, and this was of limited extent. Thus, he believes that the degree of arterial damage is the determining factor in the course of the infection.

Early diagnosis will be facilitated if the surgeon is suspicious of any case which, from the history or physical findings, presents evidence of serious arterial damage. A history of sudden increase of pain in the wound is of the greatest importance; the pulse and temperature chart cannot be relied upon. Direct examination of the wound may show marked edema, tension, and crepitation. A thin serosanguineous discharge is usually present and a dead horse odor is very common and pronounced.

In this series there were 35 cases of gas gangrene with a 31.3 per cent mortality. There should be no delay in resorting to appropriate surgery and this implies amputation. Resection of muscle groups and more conservative surgical methods are of value only in the localized forms of the infection, and are of no value in stopping the spread of infection of the gangrenous type. The amputations should be done at the level of an adequate blood supply; this will not necessarily coincide with the upper limits of crepitation or infection, which may extend well beyond the limits of vascular damage. The amputation should always be of the guillotine type.

Blood transfusions and plasma are important adjuncts to surgery. Sulfonamides probably have no direct effect on the clostridial infection but should be used to reduce the synergistic organisms. The author does not believe that antitoxin is of any value, and could detect no difference between the cases in which it was used and those in which it was not used. He does not believe that he can evaluate the value of penicillin in this infection, but advocates its use.

F. J. LINDENBAUM, JR., M.D.

Meleney F. L., and Johnson, B. Bacitracin Therapy. *J. Am. Med. Ass.* 1947 33 675

In May, 1943 the authors isolated an aerobic gram-positive spore forming bacillus which was an antibiotic agent. The active principle was present in the filtrate of the bacterial culture and was named bacitracin.

The crude filtrate was found to inhibit the growth of hemolytic streptococci in the test tube and on blood agar plates. The crude filtrate also was found to have an abortive action on certain local human infections, such as furuncles and carbuncles, when injected into the center of the lesion.

Herbert Anker, biochemist, extracted the antibiotic from the crude filtrate with butyl alcohol and obtained a preparation in an aqueous solution. When this was dried an amorphous, slightly yellowish powder was obtained.

During the last 3 months a preparation which is highly soluble and of low toxicity has been made available.

The results of 90 surgical infections treated during the last 3 years are presented. The first 7 in-

fections were treated with the crude filtrate from the culture of the bacillus which produced the antibiotic, the next 30 infections were treated with the concentrated product prepared by Anker and the remaining 63 were treated with material furnished by Ben Venne Laboratories.

These cases represent the ordinary run of surgical infections. In many cases the lesion has been treated unsuccessfully with penicillin or sulfonamide drugs, the organism being found resistant or antagonistic.

Bacitracin was administered in two forms: (1) in an aqueous solution and (2) in a water soluble ointment base. Fifty-seven infections were treated with solution, 35 with ointment and 22 with both. Excellent results were obtained in 31 cases, good results in 57 and questionable results in 9; in 3 cases bacitracin was ineffective. Excellent results are those in which the infections treated with bacitracin responded within 72 hours. Illustrative cases in each group are reported.

Response to bacitracin was significant, with prompt subsidence of swelling, redness, and exudate, or the rapid resolution of the infection. All infections treated in the first 3 days showed a favorable response. The results were not entirely satisfactory in infections which had been present longer.

The unit has been established tentatively as that amount of bacitracin which can be diluted 1,024 times and still inhibit the growth of 0.1 c.c. of a 1 to 100 dilution of an 18 hour culture of stock strain of hemolytic streptococci (representing about 1 million organisms) when planted in 2 c.c. of culture medium.

The well known producers of penicillinase do not inactivate bacitracin and it is for that reason that the latter agent may be more effective in the treatment of mixed infections. The majority of infections treated showed a mixture of organisms. Only the coagulase positive staphylococci were present more often in pure than in mixed cultures. None of the gram negative aerobic bacilli that were tested were susceptible either to penicillin or bacitracin.

Bacitracin, like penicillin will often obviate the necessity for surgical procedure. Bacitracin is neither locally toxic nor irritating and is not inhibited by plasma, blood, pus or broken down tissue.

GEORGE W. RICHARDSON, M.D.

Anderson, A. B.: Anaphylactic Purpura following Intramuscular Penicillin Therapy. *Med. J. Australia*, 1947 1 303

The author gives an account of a case of anaphylaxis, apparently resulting from penicillin therapy, and manifested by transient swelling of joints and subcutaneous tissues, intestinal purpura, and toxic nephritis.

The patient was a 37 year old male who had no family history of purpura. He was admitted to the hospital for operation for an osteosarcoma of the lower end of the femur. On the nineteenth post-operative day there was purulent discharge from the wound. Penicillin therapy 15,000 units every 3 hours, was begun a total of 300,000 units being

given. The wound healed and the patient was discharged in 1 week.

About 6 weeks later during which interval the sinus reopened and closed several times, the patient slipped and fell. The fall was followed by an acute synovitis of the right knee joint necessitating readmission of the patient to the hospital. Culture of the wound discharge revealed *Staphylococcus aureus* and the patient was given 945,000 units of penicillin over a period of 9 days, at the end of which time the sinus had ceased draining.

Two days later he developed upper abdominal pain and tenderness associated with one emesis, followed in another 3 days by raised painful areas on the arms which subsided in 4 hours. The next day there was swelling of the metacarpophalangeal joints, severe abdominal pain, diarrhea and melena and ephedrine treatment was begun.

During the next 3 days the pain, melena and swelling of the hands persisted with the addition of hematemesis. The blood platelet count was 300,000 per cubic millimeter. Treatment consisted of adrenalin, "penta kaps" and glucose. The general condition of the patient then began to improve although urinalyses revealed albuminuria, numerous casts and red blood cells. There were no retinal changes or generalized edema. Blood pressure readings were normal.

This patient showed the joint symptoms described by Schönlein and the intestinal crises described by Henoch with a persistent associated toxic nephritis.

S. LEON TRETILMAN, M.D.

Rotman Kavka, G., Hirsch, H. L. and Dowling, H. F.: A Comparative Study of Penicillins X and G and Crystalline Penicillin G. *N. England J. M.* 1947 236-314.

Four different fractions obtained from penicillium notatum have been identified and named F, G, K, and X. Fractions G and X have received the greatest attention. It is known that commercial preparations contain different amounts of these fractions.

The purpose of the present study was to determine the respective potency of each fraction. Following the intramuscular injection of penicillin X, blood concentrations were higher and urinary excretions were present for 24 hours, as compared with 18 hours after the administration of penicillin G. No difference in effect was observed between commercial and crystalline penicillin. The relative sensitivity of bacterial strains to penicillin G and X was computed on the basis of weight and some minor differences were found. Therapeutically penicillin G and X appear to be about equally effective with two exceptions: (1) penicillin X may be given less frequently due to slower excretion and (2) very occasionally a bacterial organism may be resistant to penicillin G but sensitive to penicillin X.

Only 7 patients, among a total of over 450 showed toxic reactions. Most of these occurred with early impure preparations. 6 patients had urticaria and 1 patient had fever. The rash disappeared in 5 pa-

tients in spite of continuation of treatment and the sixth patient developed urticaria of short duration 7 days after the discontinuation of penicillin. No untoward reactions were observed after intrathecal injections of 100,000 units.

ARTHUR J. LEXER, M.D.

Pulszki E. J. and Amespacher W. H.: Streptomycin Therapy for Bacteremia. *Am. J. Surg.* 1947 73 347.

The authors state that with the successful treatment of hemolytic streptococcus septicemia by the use of sulfonamides, the modern era of effective control of infection by chemical and antibiotic substances was ushered in.

Since 1943 the superiority of penicillin over all other available forms of treatment for infections due to susceptible organisms has been clearly demonstrated.

There still remain a large group of microorganisms, notably the gram negative bacilli which are refractory to penicillin and which may on occasion invade the blood stream from a suppurating lesion.

Streptomycin is the most promising antibiotic aid presently available for the management of gram negative bacillary infections.

The present data reveal results better than those obtained with the use of the sulfonamides. The effects are more rapid, more certain and serious toxic reactions are fewer and less debilitating.

Streptomycin is bacteriostatic for gram-positive cocci as well as for gram negative bacilli but its action is not as powerful as that of penicillin on gram positive cocci; therefore it is an alternative agent for those cases not responding to penicillin therapy.

Data on 24 cases of bacteremia are reported. In the 16 cases of bacteremia due to gram negative bacilli, the urinary tract was involved in 11 cases, while in the remaining cases the infection arose from sepsis in bone and in the peritoneal cavity.

The majority of patients received 1 gm. or more of streptomycin in divided intramuscular doses, and treatment was continued for an average period of 14 days. Other chemotherapy failed in 14 of the 24 patients before streptomycin was employed. Twenty-two patients recovered and 2 died. In 18 of the 22 patients, beneficial results were attributed to streptomycin and in the remaining 4 patients the results were of questionable value.

In nearly every instance the temperature subsided by a step-ladder type of lysis. In most instances the blood was rapidly sterilized of the bacteria, with surgical drainage contributing to most rapid clearance of the blood stream. Occasionally reinfection occurred after withdrawal of the streptomycin.

Little evidence of improvement was noted until the third or fourth day. All patients who recovered were benefited by the seventh day. With urinary calculi the bacteremias cleared but the urine remained infected until the calculi were removed. In cases of bone lesions the infection was localized by streptomycin but surgery was necessary.

grena had major vascular damage of the 37 patients with a localized clostridial infection, only 3 had vascular damage, and this was of limited extent. Thus he believes that the degree of arterial damage is the determining factor in the course of the infection.

Early diagnosis will be facilitated if the surgeon is suspicious of any case which, from the history or physical findings, presents evidence of serious arterial damage. A history of sudden increase of pain in the wound is of the greatest importance; the pulse and temperature chart cannot be relied upon. Direct examination of the wound may show marked edema, tension, and crepitation. A thin serosanguineous discharge is usually present and a "dead house" odor is very common and pronounced.

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F. J. LEHMANN, JR., M.D.

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GEORGE W. RICHARDSON, M.D.

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Intravenous injection (at a standard rapid rate) in mice of a solution stored for 13 days at 18 to 22 degrees C. failed to reveal any significant change in AD₅₀, LD₅₀, and LD₅₀/AD₅₀. Statistical analysis of the bio-assay data however showed that although no deterioration was demonstrated a 10 to 15 per cent loss of potency might have been obscured by the error of the method.

It is suggested that if a 5 per cent bulk solution of pentothal sodium is to be used on successive days, it should be stored in the refrigerator and discarded according to the usual practice when turbidity appears, but until further information is available the solution should not be kept longer than 3 days at 18 to 25 degrees C. or 7 days at 5 to 6 degrees C.

MARY FRANCES POZ, M D

Allen E. G., and Eversole U. H.: The Use of Curare in Anesthesia. *A. England J. M.*, 1947 236 593.

In a historical summary of curare, full credit for the modern development of the drug is given to Gill for its pharmacological and clinical trial full credit is given to McIntyre and Bennett. To Griffin and Johnson goes the credit for the introduction of curare to the field of anesthesiology in 1942. The mechanism of physiological action is discussed although the exact nature of this mechanism is not completely understood. The administration of curare produces a paresis or paralysis of the voluntary musculature throughout the body. It is supposed that the drug has no central action but further experimental work may disprove this assumption. No electrocardiographic changes in either normal or diseased hearts are noted during the administration of curare. The hypotension seen after curare is transient. The pulse is unaffected. The drop in blood pressure is only about 30 mm. of mercury and it usually lasts only a few minutes. It is questionable whether this is the result of a block in transmission between preganglionic and postganglionic fibers in the sympathetic system or of poor peripheral venous return as the result of the loss of muscle tone. A temporary loss of tone and peristaltic activity of the small bowel is produced with curare. It is rapidly eliminated from the body and most of it is broken down in the liver the remainder being excreted unchanged by the kidneys.

The method of administration may be that described by Griffin and Johnson or by Cullen. In small infants doses of 4 to 6 mgm. have been employed. The anesthetist must be prepared to treat respiratory depression or apnea, to maintain adequate airway and to understand endotracheal technique. Smaller doses are used for patients who are in shock, or are elderly or debilitated. Curare is best combined with cyclopropane. It neither increases nor decreases the irritability of the heart in this combination. When the weaker gases nitrous oxide and ethylene are used much larger doses of curare are needed. Caution must be taken when it supplements ether anesthesia as a cumulative action seems to take place. Favorable results occur with the

combination of curare and pentothal. The pure crystalline product obviates the disadvantages of precipitation occurring with this combination.

The contraindications include myasthenia gravis inadequate airway and suspected liver and renal damage. Although prostigmin is a direct antidote artificial respiration is the best treatment. Curare has proved to be a valuable adjunct to spinal anesthesia in abdominal operations for massive hemorrhage, bronchoscopies and esophagoscopies and for more extensive operations such as laminectomies, splanchicectomies and intrathoracic operations.

Thus curare has proved itself in the course of a few years to be of considerable value in the field of anesthesiology. It is not a panacea, but it is a useful adjunct and further investigation and research will set its true pattern in clinical applicability.

MARY KARP M D

Wiggin S. C., Schultz, P. E., and Saunders P.: Experience with Curare in Anesthesia. *A. England J. M.*, 1947 236 596.

The main purposes of this paper are to consider the indications for curare, its comparison with other agents, and to present experience with the use of curare (intocostarin) in 450 cases. The cases were divided into four groups. The first group were elective abdominal surgical cases in which curare was administered. The second group included cases in which a single dose spinal anesthetic for abdominal surgery was used, the third group consisted of poor risk patients and the fourth group comprised patients who required endotracheal anesthesia.

Experience with the cases of the first group led to the conclusion that the order of choice of anesthesia for abdominal procedures was as follows: (1) spinal anesthesia, (2) general light anesthesia with curare, (3) deep general anesthesia or other methods. The management of cases in which spinal anesthesia is wearing off and in which the intra abdominal surgery must be continued has been simplified by the introduction of curare. In such cases, light halothane anesthesia or pentothal plus curare has provided the needed relaxation in anesthesia for the completion of surgery.

The use of curare in poor risk patients has been facilitated by the use of light cyclopropane anesthesia with small doses of curare. Satisfactory anesthesia can thus be accomplished by their balanced use with small doses that, if used alone, would be insufficient. There have been no cumulative effects from these small doses. The use of curare to facilitate intra tracheal intubation adds another method to the various techniques of preparing patients for intubation. The advantage of this procedure is that it allows the anesthesiologist to use a light level of general anesthesia and to obtain complete relaxation in a relatively short time. The possible respiratory embarrassment following intubation is a disadvantage.

The authors state that the recovery period in all cases of all four groups was generally uneventful and

Toxic reactions observed in 2 patients were morbilliform rashes with eosinophilia, albuminuria and some pyrexia. One patient had vertigo.

Laboratory studies show that an additional effect is obtained from the use of subinhibitory concentrations of streptomycin and penicillin. Competitive excretions result in higher drug levels when both agents are parenterally administered simultaneously.

It is recommended that large doses of streptomycin be employed routinely in the beginning of therapy. From an analysis of results, it is apparent that streptomycin therapy in bacteremia can be expected to be successful if (1) the organisms are susceptible *in vitro* (2) dosage is adequate, the interval between doses provides bacteriostatic blood levels and the duration of treatment is long enough (3) surgical drainage of the primary focus is prompt and exact, and (4) due consideration is given to the management of the patient as a whole.

GEORGE W. RICHARDSON, M.D.

ANESTHESIA

Trifari, L. M., and Martin, S. J. Civilian and Military Aspects of Intravenous Anesthesia. *C. and Res. Anesth.*, 1947 26 45.

Intravenous anesthesia has followed the pattern of marked enthusiasm, followed by skepticism, and finally by a conservative and thorough evaluation so that now it is an accepted technique. Its historical technique is described, with emphasis on the role of pentothal sodium. The literary data to date are enumerated, and include conflicting views by various authors. The usefulness of intravenous anesthesia in neurosurgery, obstetrics, ophthalmology, otolaryngology and oral surgery, therapeutic, and thoracic surgery—are shown. Its use in military work was extensive in World War II and its popularity over shadowed the use of ether. Despite the initial cautions and adverse comments, the advantages of sodium pentothal have become more apparent when its limits and contraindications were fully appreciated. When anesthesiologists trained in its safe use became available, intravenous sodium pentothal was found to be just as effective and popular in the overseas military installations as in the Zone of the Interior.

Personal experience of the authors in over 4,000 administrations of sodium pentothal intravenous anesthesia corroborate the results of others. The principles of its administration, as first described by Lundy and set forth by Adams, are followed as far as possible. The intermittent method of administration of a 2.5 per cent solution was employed in all cases. Its major field of usefulness was found to be in orthopedic surgery as the sole anesthetic agent and, secondly as an induction agent for inhalation anesthesia. No deaths attributable to sodium pentothal occurred on the operating table, and no major complications were seen during the present series of

cases. The assets of simple equipment, nonemployability and ease of preparation were important factors in popularizing this agent among the overseas units.

Other barbiturates have been recently studied. These include such drugs as nembutal, ether, nembutal-barbital, cyclopal, and kemithal. Laboratory data concerning these drugs were described. The advantages of kemithal as pointed out by Halton were the notable absence of laryngospasm, the relaxation of masseter muscle, and the lack of depression of respiration. The technique of administration is described. Sodium succinate is considered a safe antidote against toxic doses of nembutal.

A discussion of curare gives it its proper place as an accepted agent in modern anesthesia. Its limitations, contraindications, and complications are now recognized and this helps to outweigh its disadvantages. With judicious use its popularity will continue to grow.

The authors discuss the use of intravenous procaine, the technique of injection, and its growing popularity. Despite the potential dangers of convulsions and severe asthma in the rare, true idiosyncrasy many advantages justify its continued clinical use. It has almost no effect on respiration, circulation, emetic center and diaphragm.

The clinical analysis of another intravenous agent, morphine is described.

The intravenous injection of ethyl alcohol is discussed from the standpoint of indications and contraindications. Its value includes analgesia, euphoria, caloric intake, and fluid intake.

Intravenous injections of other agents such as paraldehyde, avertin, ether and magnesium sulfate, to produce various depths of anesthesia, have failed to arouse significant enthusiasm. Thus intravenous anesthesia is now an established technique and is becoming increasingly popular in all English speaking countries. Particular emphasis is given to the recent reports on the pharmacology and clinical aspects of sodium pentothal, curare, and procaine administered intravenously.

The increase in volume and quality of the literature indicates that during the next few years anesthesiologists will make definite progress in intravenous technique.

Robinson, M. H. Deterioration of Solutions of Pentothal Sodium. *Anesthesiology* 1947 8 166.

A bulk solution of 5 per cent pentothal sodium prepared from the commercial ampules and kept for 65 days at room temperature of 18 to 22 degrees C. was found to deteriorate steadily with time as evidenced by the fall in melting point of extractable pentothal acid. When kept in the refrigerator at 5 to 6 degrees C. the rate of deterioration was greatly reduced. At the lower temperature sealing the flask as compared to leaving the solution open to the air prevented the formation of crystals on the surface of the fluid but had no demonstrable effect on the melting point over a period of 25 days.

Intravenous injection (at a standard rapid rate) in mice of a solution stored for 13 days at 18 to 22 degrees C. failed to reveal any significant change in AD₅₀, LD₅₀ and LD₅₀/AD₅₀. Statistical analysis of the bio-assay data, however, showed that although no deterioration was demonstrated a 10 to 15 per cent loss of potency might have been obscured by the error of the method.

It is suggested that if a 5 per cent bulk solution of pentothal sodium is to be used on successive days, it should be stored in the refrigerator and discarded according to the usual practice when turbidity appears, but until further information is available the solution should not be kept longer than 3 days at 18 to 22 degrees C. or 7 days at 5 to 6 degrees C.

MARY FRANCES POZ, M.D.

Allen E. C., and Eversole U. H.: The Use of Curare in Anesthesia. *N. England J. M.* 1947 336 533

In a historical summary of curare, full credit for the modern development of the drug is given to Gill for its pharmacological and clinical trial full credit is given to McIntyre and Bennett. To Griffin and Johnson goes the credit for the introduction of curare to the field of anesthesiology in 1943. The mechanism of physiological action is discussed, although the exact nature of this mechanism is not completely understood. The administration of curare produces a paresis or paralysis of the voluntary musculature throughout the body. It is supposed that the drug has no central action but further experimental work may disprove this assumption. No electrocardiographic changes in either normal or diseased hearts are noted during the administration of curare. The hypotension seen after curare is transient. The pulse is unaffected. The drop in blood pressure is only about 20 mm. of mercury and it usually lasts only a few minutes. It is questionable whether this is the result of a block in transmission between preganglionic and postganglionic fibers in the sympathetic system or of poor peripheral venous return as the result of the loss of muscle tone. A temporary loss of tone and peristaltic activity of the small bowel is produced with curare. It is rapidly eliminated from the body and most of it is broken down in the liver the remainder being excreted unchanged by the kidneys.

The method of administration may be that described by Griffin and Johnson or by Cullen. In small infants doses of 4 to 6 mgm. have been employed. The anesthesiologist must be prepared to treat respiratory depression or apnea, to maintain adequate airway and to understand endotracheal technique. Smaller doses are used for patients who are in shock, or are elderly or debilitated. Curare is best combined with cyclopropane. It neither increases nor decreases the irritability of the heart in this combination. When the weaker gases, nitrous oxide and ethylene are used much larger doses of curare are needed. Caution must be taken when it supplements ether anesthesia as a cumulative action seems to take place. Favorable results occur with the

combination of curare and pentothal. The pure crystalline product obviates the disadvantages of precipitation occurring with this combination.

The contraindications include myasthenia gravis, inadequate airway and suspected liver and renal damage. Although prostigmin is a direct antidote artificial respiration is the best treatment. Curare has proved to be a valuable adjunct to spinal anesthesia in abdominal operations for massive hemorrhage, bronchoscopies and esophagoscopies, and for more extensive operations such as laminectomies, splanchnicectomies and intrathoracic operations.

Thus curare has proved itself in the course of a few years to be of considerable value in the field of anesthesiology. It is not a panacea, but it is a useful adjunct and further investigation and research will set its true pattern in clinical applicability.

MARY KARP, M.D.

Wiggin, S. C., Schultz, P. E., and Saunders, P.: Experiences with Curare in Anesthesia. *N. England J. M.* 1947 336 536

The main purposes of this paper are to consider the indications for curare, its comparison with other agents and to present experience with the use of curare (intocastin) in 450 cases. The cases were divided into four groups. The first group were elective abdominal surgical cases in which curare was administered, the second group included cases in which a single dose spinal anesthetic for abdominal surgery was used, the third group consisted of poor risk patients, and the fourth group comprised patients who required endotracheal anesthesia.

Experience with the cases of the first group led to the conclusion that the order of choice of anesthesia for abdominal procedures was as follows: (1) spinal anesthesia, (2) general light anesthesia with curare, (3) deep general anesthesia or other methods. The management of cases in which spinal anesthesia is wearing off and in which the intra abdominal surgery must be continued has been simplified by the introduction of curare. In such cases light inhalation anesthesia or pentothal plus curare has provided the needed relaxation in anesthesia for the completion of surgery.

The use of curare in poor risk patients has been facilitated by the use of light cyclopropane anesthesia with small doses of curare. Satisfactory anesthesia can thus be accomplished by their balanced use with small doses that if used alone, would be insufficient. There have been no cumulative effects from these small doses. The use of curare to facilitate intra tracheal intubation adds another method to the various techniques of preparing patients for intubation. The advantage of this procedure is that it allows the anesthesiologist to use a light level of general anesthesia and to obtain complete relaxation in a relatively short time. The possible respiratory embarrassment following intubation is a disadvantage.

The authors state that the recovery period in all cases of all four groups was generally uneventful and

brief. Three patients presented respiratory depressions, and these emphasized the importance of the physiological control of respiration during the operation, and the necessity of the same careful supervision of patients who are under the effect of curare in the postoperative period.

MARY KARP M.D.

Ostlere, G.: Curare in 'Poor Risk' Patients. *Brit. M. J.* 1947 448.

The present article is based on 136 surgical cases in which curarization was performed at Hill End Hospital (St. Bartholomew's). Limitation of supplies demanded a careful selection of cases curare being used almost exclusively for abdominal and chest operations, particularly with 'poor-risk' patients.

In abdominal cases, endotracheal intubation was performed after pentothal induction followed by the administration of nitrous oxide, oxygen, and trilene. Fifteen milligrams of curare were used if needed. Anesthesia was maintained by means of nitrous oxide-oxygen with minimal trilene from a semiclosed Boyle apparatus. It is important that only a trace of trilene be employed. Curare was given when the peritoneum was first reached further doses being added as relaxation demanded.

For thoracic cases, pentothal induction was followed by cyclopropane oxygen. Blind intubation and a throat pack were usually employed just before the patient was turned on the table 15 mgm. of tubarine were given. During maintenance if the respiration increased in depth 5 mgm. of tubarine were given while any movement or an increase in respiratory rate was considered an indication for more cyclopropane.

Twenty patients with eye complaints after the use of curare have been seen. Blurring of vision was the commonest fault complained of often accompanied by other defects such as ptosis and failure of accommodation.

The author's impression was that although curare proved an inestimable boon in the theater it had no effect on the frequency of postanesthetic vomiting, and possibly slightly reduced the incidence of anticipated chest complications. The greatest advantage of curare is that it enables very ill patients, particularly those needing thoracic surgery to undergo operation without a dangerously prolonged deep anesthesia and to recover rapidly from the immediate effects of the operation.

MARY FRANCES POT, M.D.

Barnes, J.: Pethidine in Labor. *Brit. M. J.* 1947 1 437.

This article embodies the results of the use of pethidine as an analgesic agent in over 300 cases observed in the Obstetric Unit at University College Hospital London, between the years 1942 and 1946. The dose used was 100 mgm., given by subcutaneous or intramuscular injection, and repeated as required. In many cases, pethidine was combined with other sedatives and analgesics, the patients receiving ni-

trous oxide-and-air analgesia or trilene in the later stages of labor. A single injection of 100 mgm. was adequate for the majority of labors, and a high proportion of the remainder required only two doses.

There was no maternal mortality. Slight toxic effects were noted in 11 mothers. These effects were transient. Signs of asphyxia were noted in 35 infants recovery occurred in all. Pethidine may have contributed to slight respiratory depression in a few cases. Good analgesia was experienced by 55 per cent of the mothers. Failures may be accounted for in some cases by the fact that pethidine was given too late in labor. Amnesia was obtained in only 10 per cent. No effect on uterine contractions was noted in 67 per cent of the mothers. The claim that pethidine shortens the duration of labor cannot be substantiated. No tendency to postpartum hemorrhage was noted.

Although pethidine does not fulfill all the criteria laid down by Sturrock for the ideal obstetric analgesic, it is suggested that it approaches the ideal more nearly than any other agent in current use.

MARY FRANCES POT, M.D.

Jarman, Ronald; Evans, Frankie; Lloyd Davies, O. V.; Vessell, V. Eades; Dals, H. W. Loftus; and Goldman, Victor: Discussion of Anesthesia for Abdominoperineal Operations for Cancer of the Rectum. *Proc. R. Soc. M. Lond.* 1947 40 363.

JARMAN. The anesthesia technique for operations for cancer of the rectum has been more or less standardized. The method of choice is pentothal, spinal block, and nitrous oxide-oxygen. An adrenal drip during operation permits control of hypotension. Blood transfusions are given immediately after operation. Fourteen days of observation and preparation prior to operation are important. The patient is taught to use his muscles while lying in bed, especially how to breathe and use his abdominal muscles.

EVANS. The preference is for a spinal analgesia in combination with a dilute pentothal drip for excision of the rectum. This method diminishes nerve shock and tends to lower the blood pressure these results are advantages. A heavy solution of nupercaine is used for the spinal block the analgesia level being limited to the costal margin.

A special cannula has been designed for the intra-venous infusion. The adrenalin drip is started if the blood pressure falls below 80 and is continued post-operatively. In all cases, blood is given during the operation.

LLOYD-DAVIES. Turning the patient during operation can be avoided by using the lithotomy Trendelenburg position. If adrenalin has been used during the operation it must be continued in the ward until the normal vasomotor control recovers.

VESELL. Early blood transfusion during the course of operation is strongly recommended.

DALS. Cyclopropane in conjunction with spinal analgesia for abdominoperineal excision is prefer-

able to ultrous oxide as it permits an increase of oxygen. Recently spinal analgesia have been abandoned in favor of cyclopropane and curare to avoid the fall in the blood pressure.

GOLDMAN Since light cyclopropane anesthesia is generally employed, the use of adrenalin is not recommended. Instead methedrine is added to the saline infusion.

ROWBOTHAM He has given up the use of adrenalin since plasma or serum has become available and is of the opinion that the use of plasma or serum is superior to that of many analeptic drugs.

MARY FRANCES POE, M.D.

Whitehead, R. W. and Draper W. B.: A Respiratory Reflex Originating from the Thoracic Wall of the Dog. *Anesthesiology* 1947 8: 159.

The authors' experiments have revealed the existence of a respiratory reflex which is more effective in anesthetic depression than is either tongue traction or anal stretching. It is initiated by the applica-

tion of light pressure to a localized area of the chest wall.

The thoracic wall reflex has the following characteristics: the adequate stimulus is light pressure; the respiratory act induced is carried out in a smooth and normal manner and is largely diaphragmatic; fatigue of the reflex may occur but its sensitivity is rapidly restored; the reflex is susceptible to inhibition and may disappear in severe hypoxia or shock.

The reflex was obtained following very light pressure applied to the distal end of the scalenus medius muscle and its tendon or to the proximal end of the rectus abdominis muscle and its tendon. It may be significant that the reflex arises with apparently equal power from two muscles and their tendons which have opposite respiratory functions, and which in the dog happen to be in close anatomical relation.

The existence of this reflex in the human is undemonstrated but if present should prove a valuable aid to resuscitation.

MARY FRANCES POE, M.D.

MISCELLANEOUS

CLINICAL ENTITIES—GENERAL PHYSIOLOGICAL CONDITIONS

Leriche, R.: Surgical Treatment of Sjögren's Syndrome, Dry Eye and Mouth. *End Results 28 Months after Bilateral Section of the Vertebral Nerve. Nature of the Disease (Traitement chirurgical du syndrome de Sjögren, Oeil sec et bouche sèche. Résultats à bout de vingt-huit mois d'une double section du nerf cervical. Nature de la maladie).* *Presse méd.* 947 55 77

On June 15 1946 Clement called the attention of the medical profession to the rare syndrome of Sjögren which is characterized by dryness of the eyes and mouth and has no known treatment. The author recalls having seen a patient in 1939 who showed these findings, and be presented a complete and detailed history of the case.

A 50 year old woman consulted the author because of dryness of the mouth and eyes of about 5 years duration. Shortly before the onset of her illness she was involved in a car accident in which she sustained severe trauma to the head with loss of consciousness. Following this she suffered from occipitotend pain, and soon noticed that she had almost no saliva even while eating. At about the same time her teeth which had always been in excellent condition, began to disintegrate and all of them had to be extracted. There was, however, no impairment of her sense of taste smell or hearing. Her appetite remained good. Three years prior to admission her eyes became dry. The lids were normal but a few of her eyelashes were falling off. Shortly thereafter her eyes became so dry that she was unable to cry and it became necessary for her to carry a small bottle of water to moisten them as well as her mouth. One year prior to admission she developed considerable painful swelling of both parotid glands, and pus could be seen exuding from Stensen's ducts.

At the time of physical examination by the author there was comp. dryness of the mouth, lips tongue soft palate, pharynx, and eyes. There was no sign of conjunctivitis. Large drops of pus could be seen at the ostia of Stensen's ducts. A few small telangiectasias similar to scleroderma but without skin atrophy were present on the face which was somewhat shrunken due to depression of the parotid and submaxillary regions. On the basis of these findings the author as well as a medical consultant made a tentative diagnosis of atypical scleroderma.

The patient was observed for several days while attempts to revive the lacrimal and salivary gland through the production of hyperemia by sympathetic block were undertaken. Since these proved effective an operation on the sympathetic system was done. The roots of the right vertebral nerve were severed and a fragment of the cervical sympathetic chain above the stellate ganglion but including the middle cervical ganglion was resected. The same night of

the operation both subjective and objective improvement was noted. Five days later the left side was done with the same result. Immediately following operation the telangiectasias almost disappeared. Four days later the patient salivated some thick saliva. In 8 days the patient was discharged, having lost the annoying sensation of dryness of her eyes and mouth. Soon she was able to cry. These results remained permanent for 28 months when she died from acute hemorrhagic purpura.

In the author's opinion two obvious conclusions can be drawn from this case.

1. The patient presented a true case of Sjögren's syndrome. Nothing was lacking. There was dryness of the eyes mouth, and pharynx with parotid and submaxillary atrophy.

2. Bilateral section of the cervical sympathetic nerve proved effective both subjectively and objectively. On the basis of this result early surgery is indicated for relief of symptoms and to prevent atrophy of the parotid and submaxillary glands. This proposal can be justified by the following:

In all cases of Sjögren's syndrome which have been biopsied or autopsied atrophy of the salivary and lacrimal glands has been present. The author believes that this atrophy is due to a decrease in blood supply either from arterial obliteration or vasoconstriction. To prevent the atrophy and trophic disturbances in this syndrome, one must improve the deficient local circulation. This is accomplished by sectioning the cervical sympathetic chain, which abolishes vasoconstriction and also makes the glands more prone to respond to stimuli from the secretory fibers of the innervating nerves. In mild cases, periarterial sympathectomy and repeated novocain blocks may suffice but in severe cases cervical sympathectomy becomes necessary. In doing the sympathectomy the stellate ganglion is not removed in order to maintain the accelerator fibers of the heart and vasoconstrictor fibers of the upper limb. The resection of the second and third dorsal ganglion is also unnecessary.

In his case Leriche severed the branches of origin of both vertebral nerves. This was perhaps not the ideal operation although the result was good. Perhaps better results could have been obtained if resection of the middle portion of the cervical chain and removal of the middle cervical ganglion up to the lower pole of the superior ganglion had been carried out.

In the last part of his article, Leriche tried to determine the place of Sjögren's syndrome in the nosography. Is this disease simply a local process of vascular or vasomotor origin? Is it an elective atrophy of the glands? The author came to the conclusion that there is no relation between this syndrome and atypical scleroderma. It is, according to him an elective atrophy of the lacrimal gland and

all of the salivary glands. Having observed the peculiar dental disturbances of his patient and noting that her death was due to hemorrhagic purpura, the author believes that this might be a systemic disease at least in its origin. A disturbance of the neuro-vegetative system has been mentioned as the pathogenesis. This is somewhat vague and without microscopic examination of the prevertebral ganglionic one cannot substantiate such a hypothesis.

The author advised that histologic examination of the sympathetic ganglia and arteriography through the external carotid artery be done to add to the knowledge of this peculiar disease.

GERARD GAGNON, M.D.

Darmady, E. M.: Renal Anoxia and the Traumatic Uremia Syndrome. *Brit J Surg* 1947 34 262

It was the experience of the staff at an R.A.F. Casualty Clearing Station in England that successful surgery was often marred by the onset of uremia which sometimes proved fatal. Among 10,000 casualties admitted there were 44 deaths, and in 12 of these, death was directly due to renal failure. Biochemical investigations were continued and the present report deals with a further 6 cases of fatal traumatic uremia and 3 more cases of uremia with recovery. It is clear that the biochemical course of all the cases and the histological changes found post mortem in the fatal cases are sufficiently similar to warrant the assumption that some common factor was operative in producing the uremia.

The clinical features are characteristic. In the series under consideration all were severely wounded men who had suffered considerable loss of blood accompanied by shock requiring energetic resuscitative measures. Thus in many cases prolonged periods of hypotension were recorded. The onset of symptoms took place between the second and sixth day after injury. Usually the first sign was anorexia with a tendency to hiccup and this was followed in the course of a few days by copious vomiting. The tongue was dry and brown, and the patient was drowsy with attacks of hallucinations. Cyanosis was frequently present. Occasionally a petechial rash was seen over the upper parts of the body. This was thought to be a manifestation of fat embolism (a common feature in severely wounded casualties). During the prodromal period oliguria was present, although this was not always obvious unless a fluid intake and urinary output chart was kept. All the patients whose cases are recorded had an enormous rise in blood urea, oliguria, and a disturbance of electrolyte balance. The highest blood urea recorded from this series was only 66 mgm. per cent. The urinary urea remains constant at values between 1.8 and 5.5 mgm. per cent in spite of the fact that the blood urea value swings between 496, 461 and 473 mgm. per cent. The specific gravity of the urine remained between 1014 and 1018. The pH of the urine did not vary with the alteration in alkali reserve (44 to 66 volumes per cent) but remained at 6.4-6.6 and 6.8.

Disturbance of electrolyte balance. This presents several problems since not only was there an acidosis, but also hypochloremia. It was easy to alter the alkali reserve by treatment with intravenous sodium lactate but the restoration of the alkali reserve was difficult to maintain. Even if the electrolyte balance of the blood is corrected early the disease is still progressive and there is a continued rise in blood urea. The author made a study of the macroscopic and microscopic findings at autopsy along with the etiological factors and the similarity to other conditions and concluded that the ultimate cause of the death is renal anoxia.

The mechanism of the production of renal anoxia by alteration of the blood supply to the kidney by vasospasm is problematical. There is an immediate alteration in the CO_2 -combining power from the intravenous use of 5 c.c. of molar sodium lactate solution but the response to sodium chloride is slow. The body conserves its stock of sodium chloride after depletion for even after the blood chloride has returned to normal there is no secretion of chloride in the urine for 3 to 4 days. The fact that an acid urine may be secreted in the presence of alkalosis has been noted again and again. A general survey of the present series and the cases in the literature would seem to indicate that it is more important to correct the salt deficiency than the alkali reserve, but since a low alkali reserve and low blood chlorides have been found in other wounded men it is believed that the electrolyte balance does not in fact, play a major part in the production of traumatic uremia. It would appear that the tubular change is the essential and characteristic lesion in these patients dying of uremia and that the presence of pigment casts is incidental. The most acceptable theory seems to be that of renal anoxia which may well be brought about by vasospasm. This in its turn may be produced by various conditions such as shock, sensitizing antigens, dehydration and hypochloremia. Trueta (1945) has drawn attention to the fact that in shock overstimulation of the peripheral nerves may cause persistent spasm of renal and other arteries and this would lead to interference with the blood supply and result in renal anoxia.

The dangers of overalkalinization and possible help through splanchnic block, are indicated in the case of a Polish private who was wounded on April 25, 1945 by a gunshot wound of his left buttock and thigh. On the following day his leg was found to be ischemic, and the femoral artery injured. An immediate amputation was performed through the thigh. His postoperative condition was described as only fair. Five days after wounding he started to hiccup, and on the sixth day he was evacuated by air and admitted to Wroughton. He was now vomiting and his blood urea was found to be 500 mgm. per cent. His fluid intake was limited and on the eighth day after wounding his blood urea had risen to 820 mgm. per cent. Splanchnic block was then performed. His blood pressure fell, and on the ninth day after wounding his blood urea had fallen to 220 mgm. per

cent From this day on his condition rapidly improved. He was transferred 27 days after wounding his blood urea being 40 mgm. per cent on discharge.

C. FRED GORDON, M.D.

King, E. S. J.: The Nature of the Pilonidal Sinus. *Austral & Zealand J Surg* 1947 6 152.

The author believes that pilonidal sinuses are not the result of an error in fetal development. It is his belief that there is an irritation of the skin of the sacrococcygeal region of an adult which leads to a crypt formation by widening of a hair follicle or formation of a simple depression. Gradual deepening of the crypt and downgrowth of the epithelium into the subcutaneous tissue occur next. The crypt becomes the repository of debris, including hairs (which enter the sinus from without) and these cause persistent inflammation and the discharge of purulent material. This chronic inflammation results in further epithelial downgrowth. Acute exacerbations cause abscesses and fistulas or a furuncle or primary abscess bursting in or near the midline may in a similar manner become a reservoir for foreign material. It thus may become chronic and ultimately epithelization may take place.

The main features which support this hypothesis and which are not explicable on a "congenital" basis are (a) the maximum incidence in the second and third decades (b) the formation and regression of sinuses (c) multiple lesions (d) lesions not in the midline (e) the stages of development observed in adjacent sinuses, both macroscopically and macroscopically (f) the presence of hair as a foreign body and not a local formation.

An important result of this review is that in the early stages, the condition is preventable and is responsive to conservative treatment. The important point is that due attention be paid to irritative conditions in this area. In addition, an essential part of the treatment of a developed lesion whether it be an abscess or a postoperative healing area, is that particular care must be exercised to prevent the entry (since this occurs so readily here) of any foreign material into the area. JAMES WEAVER, M.D.

Morone, C. Melanotic Blastoma Occurring on an Ulceration Resulting from Trauma (Blastoma melanotico in sito su ulcerazione prodotta in seguito trauma) *Riforma med.*, 947 6 6.

The author reports a case of melanosisarcoma which appeared on the foot of a 37 year old man in whom a forced march in improper shoes had resulted in an exudative ulceration. The exudate was thin and blackish, but in spite of various methods of treatment, the ulcerated area extended and proliferation was marked. Regional glands appeared and nodules later developed on the thorax slightly above the left nipple. Axillary glands were also noted.

Histological study of an inguinal gland removed for biopsy revealed a neoplasm involving pigmented cells derived either from the germinal layer of the epidermis or from the pigment cells of the corium. The possible derivation of this tumor from epithelial or mesodermal elements is discussed as well as the possibility of a pre-existing lesion antedating the traumatic experience. The opinion is expressed that the lesion was of connective tissue origin hence, truly a melanosisarcoma, and that its appearance and development were probably stimulated by sustained trauma and long standing inflammation.

EDITH B. FARNSWORTH, M.D.

HOSPITALS MEDICAL EDUCATION AND HISTORY

Frankel, Walter K.: Paracelsus, The Founder of Occupational Medicine. *Occup M* 1947 3 283.

Occupational medicine was almost unknown in ancient times and in the middle ages. Occupational diseases are closely connected with industrialization and industrialization did not exist during those times. All manufacturing processes were based on individual manual labor in small enterprises. The environmental conditions of the work shop were not so different from the housing conditions in general as to injure the health of the workman. Where production necessitated collective labor with the accumulation of workers under less satisfactory outside conditions work was done either by slaves, as in Egypt, Babylonia, Assyria, Greece, and the Roman Empire or by unfree and unskilled workers. The social position and valuation of these groups of laborers were so low that their health was not of any interest either to their employers or to physicians. Labor and laborers were so cheap that the health of workmen and the continuity of their productivity did not influence either production or the market prices of the product, even if there was much absenteeism caused by diseases or epidemics.

In antiquity there was collective labor only in few fields of activity such as the erection of great structures and mining.

Miners' diseases did not attract the attention of the great masters of medicine and were not described in their works until about 400 years ago. At that time Paracelsus wrote his treatise "Von der Bergsucht" (literally, "About Mountain Consumption"), in which he made detailed and exact descriptions of injuries to health found so frequently in men working in the mines, injuries suffered either in the pits or from the products hauled out of the pits or from processing these products. With this book, Paracelsus established a new medical entity occupational disease and inaugurated a new branch of medical knowledge and research occupational medicine.

HARRY W. FICK, M.D.

SURGERY

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APPLIED ANATOMY OF THE FEMORAL VEIN AND ITS TRIBUTARIES

EDWARD A. EDWARDS M.D., F.A.C.S., and JOHN D. ROBUCK, Jr. Boston Massachusetts

FOR a variety of reasons, the femoral vein has become the object of frequent surgical attack yet the arrangement of the trunks entering this vessel and the pathways for its collateral circulation are not well known. Chief among the present indications for operation on the vein is the presence of venous thrombosis in the leg or thigh. The anatomy of the femoral vein will here be considered in special reference to its surgical interruption for this disease to prevent the transport of thrombotic emboli.

The usual textbook description of the femoral vein lists its tributaries as the saphenous and the deep femoral veins with only a few additional minor muscular tributaries. Yet, at operation it is apparent that several large veins enter the femoral under the deep fascia. The surgeon's problems are first to determine, within the limited exposure of his incision which of these is the deep femoral vein and which other vessels whose more transverse course in the upper thigh are less likely to transmit either the thrombosis itself or an embolus from the lower thigh, second to identify possible collateral channels of the femoral vein of a size sufficient to carry emboli around his interruption of the main trunk third to know where best to place his ligature with reference to the main anastomotic pathways from the femoral vein to the pelvic veins.

From the Department of Anatomy Harvard Medical School.

OBSERVATIONS

To shed light on these questions we have examined the arrangement of the femoral venous system in 61 extremities in the dissecting room. Previous anatomic investigations while excellent in many ways still fail to answer our problem satisfactorily. These previous investigations and the results of the present study will be considered under the separate headings of anomalies of the femoral vein proper tributaries of the femoral vein its collaterals, and finally anastomotic pathways from the thigh.

A glance at the accompanying diagrams impresses one with the great variations that exist both in regard to the pattern of the venous channels and the levels of their termination in the femoral vein. Moreover the vessels not only vary greatly from one individual to another, but also often fail to show a bilateral symmetry in the same individual. In the diagrams the terminations of all the large venous trunks have been recorded and care has been taken to locate accurately to scale, the vertical relation of these levels to the inguinal ligament. It is probable that in most live individuals the ligament would be stretched downward 1 centimeter or more below its position in the thin cadavers studied.

1 Anomalies of the femoral vein proper The only gross anomaly of the femoral vein proper encountered in this study was the termination of this vessel in the hypogastric (Fig. 9)

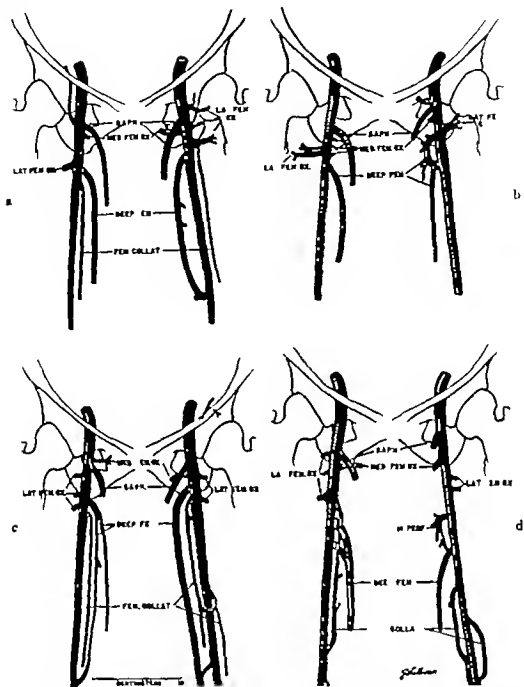


Fig. 2. Varieties of communications between the deep femoral and femoral veins. In a and c, the lower deep femoral has gross communications with the femoral. In c, left, the deep femoral is doubled. In b and d, are varieties of communications of the upper deep femoral vein.

ductor canal with rather transverse courses to the contiguous muscles.

Returning to our observations on the veins it was apparent that the *venae comitantes* of the musculoarticular and saphenous arteries did not often join to form a *supreme genicular vein*. When this did occur the resulting vessel was slender and paralleled the femoral vein for long distances, appearing as a collateral

vein, until it emptied into the femoral, or terminal deep femoral vein (Figs 1-3).

Our observations go even farther than those of Charles and his associates in pointing to the infrequency with which the *deep femoral* receives the circumflex femoral veins. In a larger series than the present namely 165 extremities these workers found that the circumflex veins emptied wholly into the femoral

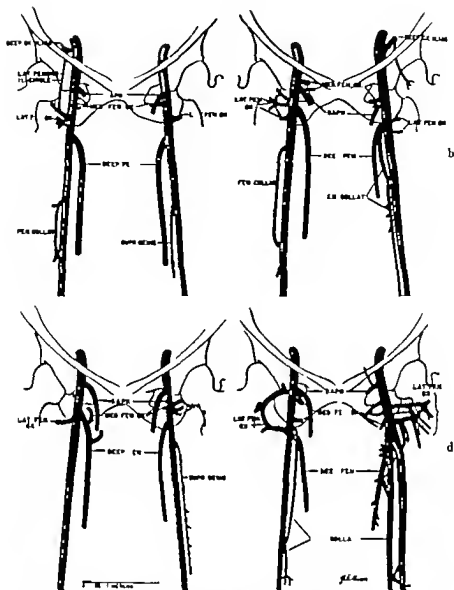


Fig. 3. Varieties of collateral femoral veins. None extend much higher than the deep femoral ending. I and c, apparent collaterals are actually the supreme genicular veins. In d, there is "double" femoral vein.

vein proper in 76 per cent. In our study the deep femoral received the medial femoral circumflex but once the lateral, five times. More over the venae comitantes of the first or second perforating arteries may likewise enter the femoral (Fig. 2 b d). We may therefore define the deep femoral vein as the vessel resulting from the fusion of the lower perforating veins usually receiving the upper perforating veins, and occasionally the circumflex femoral veins.

The deep femoral vein (figs. 1-2) is almost always the most inferior of the large venous channels entering the femoral though a low lateral femoral circumflex vein or an exceptional collateral may enter at this level. The deep femoral vessel terminated in the femoral vein at an average of 8 centimeters below the inguinal ligament. The shortest distance was 5 centimeters the longest 11.5 centimeters. There was only approximate correspondence with the height of the individual. Moreover while

bilateral equality of level was the rule exceptions were found varying up to 3 centimeters.

In 6 instances the inferior end of the deep femoral vein showed a large communication with the femoral just above the adductor opening. It is obvious that such a connection must be taken into account as a possible pathway for extension of a thrombus or an embolus from a process in the popliteal or lower femoral vein. In 3 instances (Fig 2 b d) the deep femoral terminated by 2 mouths entering the femoral vein. Such a communication would again be of significance in an attempted interruption. In 3 cases the deep femoral showed doubling.

The *lateral femoral circumflex vein* usually emptied into the femoral above the deep femoral vein. Often the tributaries corresponding to the 3 main divisions of the artery remained as separate trunks so that 2 or 3 lateral femoral circumflex veins were not uncommon and the lowest of these sometimes ended in the deep femoral.

The *medial femoral circumflex vein* was ordinarily the highest of the large veins to enter the femoral ending at or above the level of the saphenous termination. It was usually single. When it terminated as two veins the upper occasionally received the small deep external pudendal vein. In most instances however this vein ended directly in the femoral.

The superficial subinguinal veins, including the *superficial epigastric circumflex iliac* and *external pudendal* veins ended as small vessels in the terminal *saphenous* or occasionally directly in the femoral vein immediately above the saphenous. Little additional need be said of the saphenous vein. Its anatomy has been covered in a previous report (4). Its termination in the femoral is of course easily seen lying as previously reported at an average of 1.7 centimeters below the pubic tubercle which corresponds quite well to a point four centimeters below the inguinal ligament as measured in the present study.

Additional veins terminating in the femoral were irregularly placed and generally small tributaries from the muscles as well as collateral veins and circles to be described in the following.

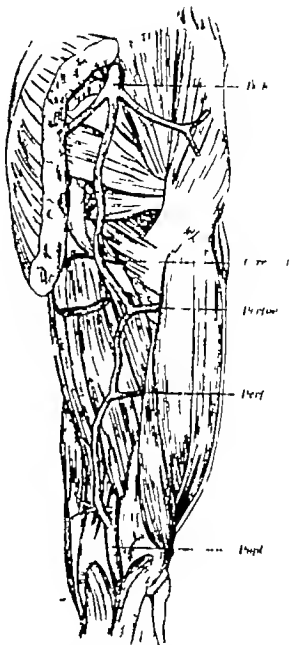


Fig 4. The collateral venous plexus in the posterior thigh. The deep veins were injected after the femoral was tied at the inguinal ligament. (From Hovelacque.)

3 *Collaterals of the femoral vein* Clinically the term collateral is used to denote any anastomotic channel. Anatomically the word is more limited and it may be well to define it now in order to differentiate collaterals from the venous circles to be mentioned in the next section. The characteristics of a true collateral have been summarized by Hovelacque. It is a vessel that runs parallel to a more important vein and communicates with the major vein at its two extremities. In this

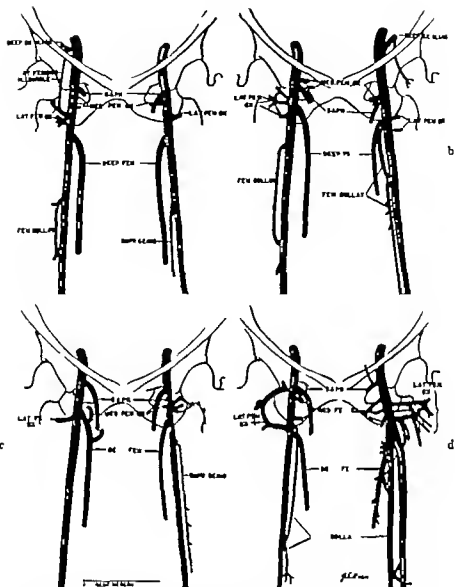


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Fig. 9. Benign lymphoid polyp of the rectum. The head of the polyp is composed of hyperplastic lymphoid tissue with scattered secondary nodules. These lesions have been cured by local excision and have never been followed by malignant changes (the 53 seen in the ALI) (X 35 ALI Acc. 1479)

where in this survey. Glandular polyps which were discovered in the intestinal tract during autopsy when death had resulted from other causes, were not included in this series. It follows, therefore, that the polypoid lesions of the intestinal tract in the present series were nearly all instances of a primary clinical disease. Only a general statistical survey of adenomatous polyps has been attempted. Analysis of this material as to its relation to the genesis of cancer of the intestinal tract would need to be the object of a special study.

The 3 instances of diffuse polyposis of the large intestine all occurred in white males and



Fig. 10. Esophageal cyst found in all of esophagus lined with columnar epithelium. The muscularis propria surrounds a part of the esophageal wall (X 45 ALI Acc. 14720)

all terminated fatally with death the result of surgical complications. Adenomatous polyps totaled 135; 105 of these were located in the rectum; the remainder were distributed throughout the intestinal tract as indicated in Figure 8. In 10 instances the diagnosis bore the qualifying phrase "with cellular atypism" or with early carcinomatous change. There were no fatalities recorded in the entire group. There were 12 females in the series, 11 negro males, and 1 mongolian male. So far as is known all

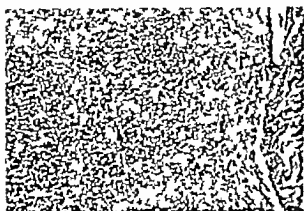


Fig. 11. Hemangioendothelioma of stomach. Tissue on right is fibrous connective tissue. Tumor tissue has vascular background but cells are almost entirely smooth muscle cells, pericytes of small vessels. (X 75 ALI Acc. 186447)



Fig. 12. Hemangioendothelioma of stomach. Wilder reticulum stain brought out the highly vascular character and arrangement of reticulum in relationship to the vessels. (X 75 ALI Acc. 186447)

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Additional veins terminating in the femoral were irregularly placed and generally small tributaries from the muscles as well as collateral veins and circles to be described in the following.

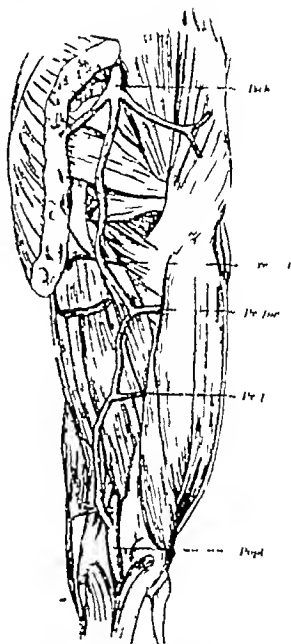


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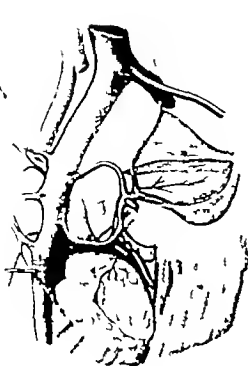


Fig. 5. Venous circles. On the left the medial femoral circumflex vein anastomoses with the obturator and on the

right, its posterior portion enters the inferior gluteal. Arrows indicate valve orientation. (From Braune.)

way it extends from one segment of the parent vein i.e. a portion between two valves, to another segment. Valves are usually present in the collateral and are always directed centripetally. The rôle of collaterals is denoted in their being termed *canaux de sûreté* (Verneuil 5). Their functions are to receive overflow from the principal vein—preventing stasis, equilibrating pressures and relieving valves in the main trunk from excessive strain. Picqué and Pigache, finding more and larger collaterals of the femoral vein in the newborn thought them to be vessels in a state of “regressive atrophy.” While this may be true it hardly explains their occurrence although it may prove that the body economy may not demand their persistence in their original size.

Langer had insisted that quite constantly two or three collateral femoral veins are present. From the present study one may agree that at least one such vessel is almost always present though so small as to be easily overlooked. The form of collaterals coincides quite

well with the descriptions offered by Langer and by Picqué and Pigache. The vessels are generally narrow longitudinally disposed channels, originating in the popliteal or the lower femoral veins. They are remarkable for the limited number of their communications with the femoral and for their termination in the lower levels of that vein. It is rare to find them continued above the ending of the deep femoral vein. Moreover they receive but a few tributaries, which are small veins from the muscles. The supreme genicular vein often ascended for long distances and appeared as a collateral vessel. This is also mentioned by Hovelacque who adds that an articular vein from the popliteal region may also constitute a collateral. “Insular” formation by division of the femoral, and fusion at a higher level has been observed.

Great enlargement of a collateral to give doubling of the femoral vein was encountered only twice. One may agree with Picqué and Pigache that even in these instances each

of the pair of veins receives the tributaries characterizing the usual femoral vein and a collateral, respectively. Moreover a doubling of the femoral vein was never seen in its upper most portion.

Mention must here be made of the anastomotic chain in the posterior thigh effected by the junction of the perforating and both circumflex femoral veins with the popliteal below and the inferior gluteal above (Fig. 4). The pathway thus formed constitutes an additional collateral system for the femoral vein. The inconstancy of its popliteal connection tends to reduce its usefulness. Moreover its valves are arranged as in a venous circle, that is for flow to each segmental parent trunk rather than for an uninterrupted upward flow. Apparently however the veins of this pathway dilate easily rendering the valves incompetent, for it is shown to be the most important anastomotic pathway in interruptions of femoral vein at any level (6).

It may be well to note that two other veins beside the femoral assist in drainage from the upper thigh namely the inferior gluteal and the obturator. Their direct drainage is so limited however that they perform this function mainly through their anastomoses with tributaries of the femoral vein. We may now consider in more detail the nature of these and other anastomoses at this level.

4. *Anastomotic pathways from the thigh* It will be recalled that true collateral vessels were found anastomosing with the femoral vein but reaching no higher than the deep femoral termination. Above this point only occasional collaterals exist, in the form of arcades along the constituent trunks of the medial or lateral circumflex veins. Only exceptionally are the anastomoses found valved for centripetal flow from the femoral to the iliac veins. Instead these communications are valved so as to form channels denoted by Braune as venous circles. In these (Figs. 5 and 6) the valves are so oriented that blood may flow into each of the veins, or vein segments, which the circle connects but not from one level to the other. In order to function as collaterals, it is therefore necessary that such vessels undergo a preliminary dilatation to render the valves incompetent.

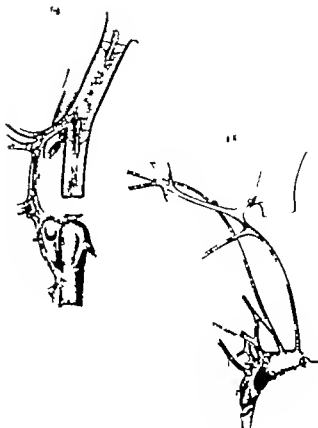


Fig. 6 The lateral femoriliac circle. A deeper component is shown in the lower right. Arrows indicate valve orientation. (From Braune.)

The largest of the venous circles encountered was the bifurcated pathway constituted by the inoculation of the medial femoral circumflex vein with the obturator and inferior gluteal veins (Figs. 7, 8, 9). The prime importance of these pathways has been indicated by the injection experiments of several workers (2, 5, 6, 10). These are not only the largest of the anastomoses from the femoral vein upward but moreover as Braune pointed out valves may be lacking in the medial femoral circumflex vein allowing an immediate centripetal flow (Fig. 8 a, d).

Accessory routes in this vicinity probably arranged as venous circles, are the communications between the deep external pudendal and the internal pudendal and obturator veins, as well as with the deep dorsal vein of the penis. The latter in turn empties into the vesicoprostatic plexus within the pelvis. Here experiments (1, 6) indicate that the sacral veins, and the entire vertebral system of veins, aid the iliac in carrying the blood upward.



Fig. 7. Varieties of valvular arrangement in the gross anastomotic channels of the femoral vein. The veins collateral to the lower femoral vein are valved centripetally. The veins extending from the upper femoral to the iliac veins are valved toward each parent trunk. In both 'a' and 'b', the anastomosis from the medial femoral circumflex to the inferior gluteal is incomplete. In 'b', the lateral femoroiliac circle is incomplete.

In lateral relation to the femoral vein lies a venous circle described by Braune as the circumflex iliac circle, and denoted here as the lateral femoroiliac circle (Figs. 7, 8, 9). This vessel extends usually from the lateral femoral circumflex vein or the femoral above this level, to connect with the deep circumflex iliac vein. Connections with the superficial circumflex iliac vein were not uncommon and occasionally as Braune shows the circle may be made up of several vessels, some superficial, others deep to the femoral artery or nerve

(Fig. 6). The valves of this circle are rather perfectly oriented toward each of its two ends. This fact as well as its usual small caliber limits its immediate utility as an anastomotic path. Yet it would seem that this vessel deserves a place in our textbooks and in our thinking. It was found in the present study in 17 limbs, and it is the writer's impression that some small vessel or vessels representing it may be even more often observed. Moreover it is not always small for in one case (Fig. 9) it attained a diameter of 1 centimeter.

It should be mentioned here that aside from the deep anastomoses mentioned there exists a series of superficial venous circles connecting the femoral with other veins. Reference is made to the upper end of the saphenous and its tributaries which, when dilated furnish large anastomoses from the femoral to the veins of the trunk and axilla.

SUMMARY AND CLINICAL CONCLUSIONS

The femoral vein may vary in its relation to the femoral artery occasionally lying anterior or lateral to that vessel. Rarely it may course for a variable distance in the posterior thigh. Collaterals of the vein are extremely frequent in its lower course and occasionally a collateral may be large enough to constitute a doubled femoral vein.

The deep veins of the thigh join the femoral as several trunks rather than as a single one. The deep femoral vein is formed by a fusion of the venae comitantes of the perforating arteries and only seldom receives the lateral or medial femoral circumflex veins which enter the femoral vein separately. Each of the circumflex veins may exist as two or three vessels. The deep external pudendal vein may join the medial femoral circumflex, or the femoral vein directly.

In identifying the tributaries of the femoral vein the level of termination of each vessel is of some value. The deep femoral vein enters the femoral vein at an average of 8 centimeters or four finger breadths below the inguinal ligament. The lateral femoral circumflex vein enters the femoral above this point, and the medial femoral circumflex at a still higher level—approximately that of the saphenous termination. The inguinal ligament used as a point of reference here is not usually identified during life and the crease of the groin may be deceptive, since it descends with an increase of bodily fat. The pubic tubercle is a better landmark. It lies about 2 centimeters below the part of the ligament referred to in this study.

The lower deep femoral vein was found to have a gross communication with the femoral in 10 per cent of our limbs. There is thus great danger of extension of a thrombus along the deep vessel when the popliteal or lower fem-

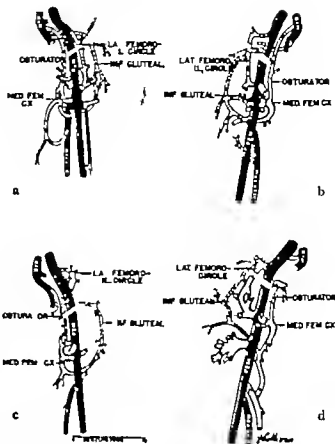


Fig. 8. Varieties of valve arrangement in the gross anastomotic channels from femoral to iliac veins. Exceptional arrangement allowing uninterrupted centripetal flow is present in the medial femoral circumflex veins in a and in d, and in the lateral femoral iliac circle in b, in c, and in d.

oral vein is thrombotic. This fact suggests that the femoral should always be interrupted *above* the termination of the deep vein. The other veins entering the femoral have fewer possible connections with a process at the popliteal or lower femoral level. It is only when thrombosis exists in the upper part of the femoral vein that interruption need be done above the ending of the femoral circumflex veins.

Two other factors may influence the choice of the level for interruption of the femoral vein. They are the amount of the blood mass impeded and the anastomotic channels available at various levels.

Three levels at which it is practicable to divide the femoral may be considered in this connection.

1. *Below the termination of the deep femoral vein.* This ordinarily gives rise to little or no

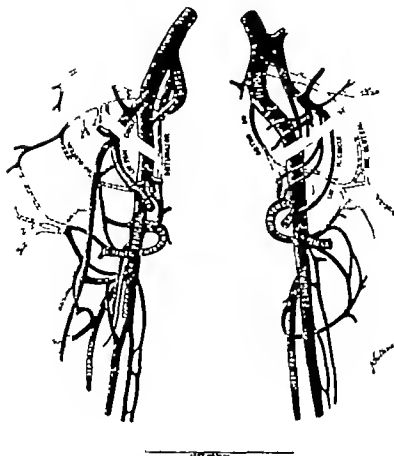


Fig. 9. Gross anatomy of the femoral vein and its arrangement in the main anastomotic channels from femoral to iliac veins. The left femoral enters the pelvis normally but terminates in the hypogastric vein. A small external iliac vein is present. An unusually large lateral femorotibial circle is present in the right thigh. On both sides this structure is valved centripetally (unusual). The circles formed by the medial femoral circumflex and obturator and gluteal veins are valved toward each parent trunk.

venous obstruction. Comparatively little blood mass is impeded and the deep femoral vein constitutes a good anastomotic channel. Collateral femoral veins when present are likewise good anastomotic pathways because they too are valved for centripetal flow. They suffer from their usual failure to reach upward high enough to cross this point of vein division. Interruption at this level will fail to close off pathways for embolism in 10 per cent of individuals.

2. *Above the deep femoral but below all or the major number of lateral and medial femoral circumflex channels.* This interruption has the merit of not trapping the large amount of blood carried by the circumflex or the saphenous veins. Moreover the saphenous is sub-

jected to minimal dilatation. Interference with blood flow nevertheless may be considerable because of the usual paucity of gross anastomoses across this level. The largest path available is formed by the chain of veins in the posterior thigh contributed to by the deep femoral vessels and ending in both femoral circumflex vessels, and the inferior gluteal above. The valves in these veins are oriented toward each parent trunk, rather than in an uninterrupted upward direction, and the lower parts would require a period of venous dilatation before their valve resistance would be obviated.

3. *Above the level of the saphenous and both femoral circumflex veins.* This is an alternative position for interruption above the deep fem-

oral termination. In comparison with the previous level mentioned a larger mass of blood is trapped below the ligature, and there is the added disadvantage in the inability of the saphenous to empty itself through its communications except after dilatation overcomes its valve resistance. Theoretically this should lead to the highest incidence of varicose widening of the saphenous.

The advantage of using this level lies in the availability of gross anastomotic routes leading upward to by pass the interruption. The largest of these is a 'venous circle' comprised by the medial femoral circumflex vein anastomosing with the obturator and inferior gluteal veins. Accessory channels medial to the femoral vein consist of the deep external pudendal vessel communicating with the dorsal vein of the penis and the internal pudendal and thus with the pelvic veins. Laterally there is often present a 'lateral femoriliac circle' connecting the femoral to the deep circumflex iliac veins.

The routes mentioned as well as the superficial anastomoses leading from the saphenous to the veins of the trunk and axilla, are most often valved as venous circles, that is, toward each parent trunk, rather than from the femoral upward. This renders the anastomoses unusable as collateral channels until they have undergone dilatation with resulting valvular incompetence.

Femoral division at this level, often produces much more cyanosis and edema than division at either of the two other levels mentioned. Nevertheless in the few cases in which one of us (E. A. E.) has divided the femoral vein at this level the symptoms have subsided in a few hours or days presumably when dilatation of the anastomotic channels has become adequate.

It would be well for surgeons to record carefully the exact level used in operations on the femoral vein based upon a more exact localization than heretofore used. In this way optimal levels of interruption may ultimately be learned.

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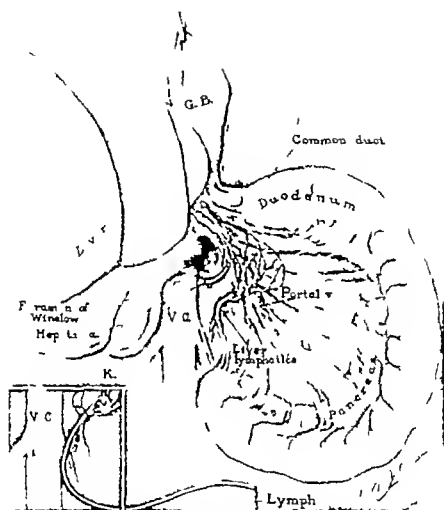


Fig. The extrahepatic lymphatics in the dog.

Lymph from Liver and Thoracic Duct—James C. Cain, John H. Grindley, Jesse L. Bellman,
Emmie V. Flock and Frank C. Moss

LYMPH FROM LIVER AND THORACIC DUCT

An Experimental Study

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SINCE 1894, when Starling showed that ligation of the inferior vena cava above the openings of the hepatic veins caused marked increase in the flow of lymph in the thoracic duct, it has been presumed that the liver is the site of origin of a major portion of the lymph present in the thoracic duct. Markowitz and Mann however in 1930 noted that the flow of lymph in the thoracic duct after hepatectomy was diminished only slightly if at all. Their dogs, after hepatectomy made the usual response to administration of lymphagogues, with great increase in the flow of lymph in the thoracic duct.

Few attempts have been made to study uncontaminated lymph from the liver. Most investigators have cannulated the thoracic duct in the neck and indirectly have estimated the flow of hepatic lymph. The purpose of this investigation was to compare in trained dogs the rate of flow and the composition of hepatic lymph obtained directly from a cannula in the lymph vessels of the liver with similar values for lymph obtained from the thoracic duct.

MATERIALS AND METHODS

Dogs weighing 12 to 26 kilograms were used in this investigation. Except in the case of a few studies made with the animals under anesthesia, the dogs were trained to stand while the lymph was collected. The best preparations were in the young dogs. Approximately a third of the operations resulted in satisfactory preparations as evidenced by a free and uniform flow of lymph. In this paper the

term fistula will be used to describe the condition after this operation. The lymph was collected continuously for as long as 50 hours from the liver and 8 days from the thoracic duct.

The cannula used consisted of capillary sized plastic tubing that extended several inches beyond its exit through a tiny stab wound in the body wall. In these investigations polyvinyl resin tubing (transflex¹ size 24) was used. The tubing was flexible, quite elastic, transparent and smooth walled. It could be cut with a knife or scissors as easily as rubber. It did not crack or tear and it could be sterilized by boiling. Small sized tubing was practically inert biologically although it was found that enough plasticizer is present in larger masses of polyvinyl resin substances to cause slight irritation. Probably the most valuable characteristics of this tubing were its flexibility and its tendency to cause only slow clotting of lymph within it.

The end of the tubing which was placed in the lymphatic was cut on a bevel of approximately 45 degrees. The exposed surface of the lymphatic to be cannulated was stripped clean and a tiny hole was made in the presenting surface. While tension was placed on the lymphatic and the hole was held open with a fine seeker of blue glass, the beveled tip of the transflex tube was inserted into the lymphatic. Frequently the first valve of the lymphatic was ruptured or evaded by the glass seeker in which case it was possible to insert a longer length of tubing in the lymphatic. After the tube was in place and the glass seeker with drawn a previously placed ligature was tied about the lymphatic and tubing.

In the dog the lymphatics emerge from the hilum of the liver and, anastomosing freely

¹From the Divisions of Medicine and Experimental Medicine, Mayo Foundation.

Abridgment of a thesis submitted by Dr. Cain to the Faculty of the Graduate School of the University of Minnesota in partial fulfillment of the requirements for the degree of M.S. in Medicine.

Presented in the Forum on Fundamental Surgical Problems before the Clinical Congress of the American College of Surgeons, Cleveland, Ohio, December 6 to 10, 1946.

²The transflex tubing used in this study was furnished through the courtesy of the manufacturer, Irvington Varnish and Insula Co., Irvington, New Jersey.

TABLE I.—RATE OF FLOW OF LYMPH IN DOGS,
CUBIC CENTIMETERS PER 10 MINUTES

Description of dogs	Determined alternately				Determined separately			
	Liver		Thoracic duct		Liver		Thoracic duct	
	Range	Mean	Range	Mean	Range	Mean	Range	Mean
Anesthetized	1-8	4.5	0-17	7	1-8	4.5	1-11	5.5
Trained, not anesthetized	1-3	2.5	0-8	7.7	1-8	7.7	0-8	5.5
All dogs		4.5		4.5		5		7.5

over the surface of the gastrohepatic ligament run caudally to the hepatic lymph node adjacent to the portal vein (Fig 1). These vessels and the lymph within them are transparent and almost colorless. The lymphatics are thread-sized, have extremely thin and delicate walls and possess valves at frequent intervals. Emerging from the hepatic lymph node and passing dorsally toward the vena cava are a few efferent lymphatic trunks, one of which is usually larger than the others. This largest efferent lymphatic was the one that was cannulated. Occasionally we have seen 2 or even 3 hepatic lymph nodes with variations in the number and anastomotic arrangement of the efferent trunks.

As previously indicated in order to obtain virtually all the hepatic lymph a mass ligature was placed around the entire efferent lymphatic region after the largest vessel had been cannulated. In order to block the few small lymphatics which enter the hepatic node from the duodenum and pancreas, one or more mass ligatures were placed about the afferent lymphatics at the caudal end of the hepatic lymph node.

In a few early studies the thoracic duct was cannulated at the usual site, where it joins the left subclavian vein. When the duct was cannulated near its origin a greater flow of lymph for a longer time was obtained. Recently we have cannulated the duct above the diaphragm where usually it is a single vessel lying behind the descending thoracic aorta. Smaller lymphatic vessels of the retro-aortic areolar tissue were occluded by a mass ligature of this region. Since there are no valves in the thoracic duct, the plastic tubing could usually be

threaded down the duct until its tip was in the cisterna chyli.

RESULTS

The normal rate of flow of lymph in the thoracic duct has been variously estimated as from 1-24 to 270 cubic centimeters, with an average of 4.0 cubic centimeters, per 10 minutes. Estimation, by direct measurement, of the total quantity of lymph produced by the liver has not been made previously. The normal rate of flow of lymph in both the thoracic duct and the liver as determined under various experimental conditions by use of the technique described in preceding paragraphs, is shown in Table I. There is great variation in range of normal rate of flow of lymph both from the liver and the thoracic duct. The rate of flow was increased after anesthesia with ether. Under the conditions of these studies, the liver contributed approximately a fourth to a half of the lymph in the thoracic duct. The rate of flow was apparently greater in large, than in small dogs and in young, than in old dogs. The state of hydration and stage of digestion were also important factors which affected the rate of flow.

The protein content of lymph from different parts of the body varies. Lymph from the leg contains, according to Drinker and Yessley 0.5 to 1.5 grams of protein per 100 cubic centimeters. In the studies reported herein, the value for protein in lymph from the thoracic duct was about half the value for that in blood plasma. The value for protein in hepatic lymph was usually approximately five sixths the value of that in blood plasma. Animals with fistulas either of the lymph vessel of the liver or of the thoracic duct soon gave rather marked evidence of hypoproteinemia. This occurrence is easily understood when it is remembered that, in 24 hours, approximately 280 cubic centimeters of lymph will drain from a hepatic fistula and that approximately 700 cubic centimeters will drain from a fistula of the thoracic duct. There is some evidence that most of the protein in hepatic lymph is newly formed. Loss of weight is conspicuous in dogs with either type of fistula.

That glucose, when injected intravenously acts as a lymphagogue, as indicated by an in-

of these lesions were treated by local surgical eradication, and in some, secondary and even tertiary operative procedures were carried out for the removal of additional polyps. There were no instances in this series in which there was subsequent clinical evidence of malignancy. This would be expected from the arbitrary manner these cases were selected and from the fact that the polyps were excised.

CARCINOIDS

Of the 76 carcinoid tumors found in the gastrointestinal tract 65 were in the appendix, 10 of the remaining 11 took their origin in the rectum and 1 in the stomach. Twelve of the patients were under 21 years old, 44 between 21 and 30, and 9 between 31 and 38. The age distribution in this group is definitely younger than in the carcinoma group. Seven females and 2 negro males were in the series. Detailed information with regard to regional infiltration and extension to neighboring tissues and lymph nodes was available in a few instances, but no attempt was made to evaluate these features statistically because of the sketchy character of the records. There is no instance of fatal outcome nor were any specimens diagnosed as malignant carcinoid. All of these tumors belong histologically to the classical type of carcinoid with the exception of the rectal group, most of which had histologic features similar to those described by Stout under the designation of 'pre-enterochrome argentaffinoma.' There were 10 of these tumors, they were characterized by ribbons of cells arranged in complicated curls and festoons. They were free of lipid substances and attempts to demonstrate silver reducing granules were unsuccessful. Nevertheless, these tumors were classified as carcinoids; they will constitute the subject matter of a separate report. The identification of these lesions evidently proved difficult, for a number of them were regarded as adenocarcinomas at the time of the first examination. None of these lesions was treated by radical measures and so far as is known no case has been complicated by local invasion or metastasis after removal of the carcinoid.

Benign lymphoid polyp. There were 53 cases with the diagnosis of benign lymphoid polyp of the rectum. The lesions conformed clin-

ically and anatomically to those described by Dukes and by Hayes, Burr and Pruitt. The age distribution was 3 under 21 years of age, 16 between 21 and 30, 11 between 31 and 38 years, and 23 unspecified. Three of the patients were female, 2 were negro male. The disease was cured by local removal; there was no record of recurrence or of fatal outcome.

LEIOMYOMAS

There were 17 tumors of smooth muscle origin in the series. Fourteen of these were benign leiomyomas while the remaining 3 were recorded as leiomyosarcomas. The 14 benign tumors occurred in the esophagus (3), stomach (10), and small intestine (1). All 14 were found in males, 4 of them negroes. In most instances these tumors were incidental findings at autopsy; however, several of them produced symptoms which necessitated surgery and death occurred from postoperative complications in 2.

Of 3 leiomyosarcomas in the series, 2 arose in the stomach and 1 in the small intestine. One of the gastric tumors occurred in a 24 year old female; the lesions were multiple and varied from 2 to 4 centimeters in diameter. The other occurred in a 27 year old white male; the tumor was 6 centimeters in diameter. The specimen from the small intestine, 5.5 centimeters in diameter, was obtained from a 22 year old colored male.

LYMPHOMAS

A detailed consideration of the instances of involvement of the gastrointestinal tract by tumors of the hematopoietic system will be incorporated in the general survey on lymphoid tumors. For the purposes of this study it suffices to note that 22 tumors belonging to this group were coded. Five tumors of the group were seen in persons under 21 years of age, 14 in those between 21 and 30, and 3 between 31 and 38 years of age. Sixteen of the lymphomas were classified as lymphosarcoma, 4 as reticulum cell sarcoma, and 1 each as leucemia and Hodgkin's disease. They were distributed anatomically as follows: lymphosarcoma and reticulum cell sarcoma—4 in the stomach, 6 in the small intestine, 1 in the appendix, and 4 in the large intestine. There

crease in the rate of flow of lymph in the thoracic duct has been known for many years. It had been assumed under these circumstances, that most of the increase in quantity of lymph originated in the liver. In the studies reported herein determinations were made of the effect of intravenous injection of 20 per cent solution of glucose at a rate of 0.5 gram of glucose per kilogram of body weight, into 12 dogs with a lymphatic fistula of the liver and into 8 dogs with a fistula of the thoracic duct. In every instance an increase in the rate of flow of lymph from the liver and thoracic duct occurred. In both groups the rate of flow began to increase during the first 10 minutes after administration of glucose and reached a peak within 30 minutes. On the average the increase from the hepatic fistula was 68 per cent and that from the fistula of the thoracic duct was 75 per cent. The difference between these two percentages is probably not significant. In one dog with a fistula of the thoracic duct injection of 50 per cent solution of glucose at a rate of 1.5 grams of glucose per kilogram of body weight was followed by an increase of 350 per cent in the rate of flow of lymph.

Studies were made to determine the relative changes in the sugar content of blood plasma and of lymph of fasting dogs after intravenous injections of glucose (Fig. 2). In fasting dogs before injection of glucose the sugar content of lymph from the liver and thoracic duct was, on the average about 10 to 20 milligrams per 100 cubic centimeters greater than that of blood plasma. Five minutes after intravenous injection of 20 per cent solution of glucose at a rate of 0.5 gram of glucose per kilogram of body weight the sugar content of lymph from the liver was approximately 50 milligrams per 100 cubic centimeters higher than that of lymph from the thoracic duct. When the rate of flow of lymph from the two sources is considered this finding would appear to indicate that glucose was more diffusible through the capillary bed of the liver than through that of the remaining part of the body drained by the thoracic duct.

Study of the effect of feeding was made on 5 dogs with a lymphatic fistula of the liver and on 18 with a fistula of the thoracic duct. The rate of flow of lymph which was increased in

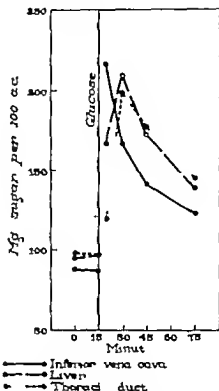


Fig. 2. Effect of intravenous injection of 0.5 gram of glucose per kilogram of body weight on the sugar content of hepatic lymph, of lymph from the thoracic duct and of blood plasma.

all instances after feeding reached a peak during the second hour and remained greater than the rate before feeding for at least 5 hours. The type of meal fed was not important. The rate of flow of lymph from the liver was increased approximately 108 per cent and that from the thoracic duct approximately 79 per cent over normal. The difference between these two percentages is probably not of great significance.

The effect of brief exercise on flow of lymph was studied. The dogs were allowed to walk on the level at a rate of 40 yards per minute and the rate of flow of lymph was noted at intervals of 5 and 10 minutes. These studies were made on 5 dogs with a lymphatic fistula of the liver and on 8 dogs with a fistula of the thoracic duct. The increase in the rate of flow of lymph from the liver was approximately 83 per cent and that from the thoracic duct was approximately 270 per cent over normal. This result would be expected because of the effects of muscular movement and of massage in the region of the large lymphatic bed drained by the thoracic duct.

The chloride content of hepatic lymph and that of lymph from the thoracic duct were essentially the same and were consistently 10 to 40 milligrams per 100 cubic centimeters greater than that of blood plasma.

The values for inorganic phosphate in the lymph from the liver and thoracic duct and in blood plasma were approximately the same but the value for alkaline phosphatase in the lymph from both the liver and the thoracic duct was consistently 30 to 50 per cent less than the value for that in blood plasma.

Studies were made to determine the effect of acute and chronic poisoning with carbon tetrachloride on the flow of lymph. Two dogs were permitted to breathe for 1 hour a mixture of carbon tetrachloride and air the mixture which consisted of 1 cubic centimeter of carbon tetrachloride per 10 liters of air was circulated at a rate of 10 liters per minute. There was slight if any increase in the rate of flow of lymph from either the thoracic duct or the lymphatic vessel of the liver after this exposure. The lymph from the liver in all instances was distinctly bloody.

The lymphatic vessel of the liver was cannulated in 2 dogs with cirrhosis that had been produced with treatments of carbon tetrachloride 3 times a week for 5 months. The lymphatic vessels of the liver were dilated to an extreme degree, and the rate of flow was increased approximately 10 to 20 times normal. A fistula of the thoracic duct was made in 1 dog in which cirrhosis of 9 months duration had been produced by administration of carbon tetrachloride. In this dog the rate of flow of lymph was only 2 to 3 times normal. In all dogs with chronic carbon tetrachloride poisoning definite evidence of jaundice, ascites, and cirrhosis appeared. The content of bilirubin in lymph was approximately the same as that in blood plasma.

Ligation of the common bile duct resulted in an immediate rise in the content of bilirubin in hepatic lymph. In 2 dogs with fistulas of both the thoracic duct and the lymphatic vessel of the liver the occurrence of an immediate rise in the content of bilirubin in hepatic lymph, with no rise of that in lymph from the thoracic duct, was additional evidence that all the hepatic lymph was being collected.

SUMMARY

The average rate of flow of hepatic lymph was 2.26 cubic centimeters per 10 minutes as compared with 4.6 cubic centimeters per 10 minutes for that of lymph in the thoracic duct. Probably hepatic lymph contributed a fourth to a half the total volume of lymph in the thoracic duct.

Intravenous administration of 20 per cent solution of glucose as a lymphagogue was followed by an increase of approximately 70 per cent in the rate of flow of lymph from both the liver and the thoracic duct.

Ingestion of food and brief periods of exercise were followed in each instance, by an increase in the rate of flow of lymph from the thoracic duct and the liver. Ingestion of food increased the rate of flow of lymph from the thoracic ducts by approximately 80 per cent and that of hepatic lymph by approximately 105 per cent. Exercise increased the rate of flow in the thoracic duct much more precipitously than that from the hepatic fistula, probably because of the massaging effect of exercise on the large lymphatic beds.

Acute poisoning with carbon tetrachloride caused no gross change in the flow of lymph, but hepatic lymph became bloody. In the presence of cirrhosis caused by exposure to carbon tetrachloride the rate of flow of hepatic lymph was greatly increased but that of lymph from the thoracic duct was only moderately increased.

The protein content of hepatic lymph was approximately five-sixths that of blood plasma and that of lymph from the thoracic duct was approximately half that of blood plasma. Lymph from both the liver and thoracic duct contained sugar and chloride slightly in excess of that found in blood plasma. The content of inorganic phosphate was the same in all 3 and the value for alkaline phosphatase was 30 to 50 per cent lower in lymph from each source than in blood plasma.

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GELATIN NEPHROSIS

Renal Tissue Changes in Man Resulting from the Intravenous Administration of Gelatin

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THE currently increased interest in and greater use of gelatin as a blood substitute in the treatment of peripheral vascular collapse and as a means of parenteral nutrition demands a careful evaluation of any pathological changes for which this substance may be responsible. Three years ago the appearance of striking tubular hydropic degeneration similar to that seen in sucrose nephrosis (1, 2, 14) but now occurring in the kidneys of patients who had not been subject to sucrose therapy directed our attention to the possible etiologic rôle of gelatin in the production of these lesions. Recently Popper and associates published a report on the use of gelatin in the treatment of shock and noting similar renal tubular swelling in some of their necropsy cases also suggested that these lesions might be attributable to intravenous gelatin therapy. Continued association with a surgical service on which extensive studies of the use of gelatin intravenously have been carried out (4-7) and on which major surgical procedures are a common occurrence has presented an unusual opportunity for the further study of this lesion. The present study was accordingly undertaken in order to evaluate the rôle of gelatin in the pathogenesis of the lesion, to study the morphological nature of the changes which were produced and to appraise their functional significance.

MATERIALS AND METHODS

The study is based on the postmortem examinations of 23 patients who received gelatin intravenously in quantities ranging from 100 to 17,600 cubic centimeters with widely varying intervals between the final injection and the death of the patient. The gelatin derived from pig skin was given in an 8 per cent

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solution in physiological saline usually in doses of 800 cubic centimeters (4).

All the patients save 2 had neoplastic growths primary in the tissues of the abdominal cavity. Of the exceptions one suffered with a squamous cell carcinoma of the lower lip and the other from a chronic bleeding gastric ulcer. All but 3 died of their primary disease and its complications or from complications resulting from the surgical procedures most of which involved extensive regional resections. In most instances the gelatin therapy was given in association with the surgical procedures and either instituted as part of the preoperative preparation or more commonly begun at and continued for varying intervals following the operation.

The postmortem examinations were all performed within 17½ hours of death in the majority of instances the postmortem interval was 2 to 10 hours. Blocks of renal tissue were fixed in Zenker's solution at the time of necropsy, embedded in celloidin and sectioned at 8 microns. The tissues were stained with Heidenhain's iron hematoxylin, Heidenhain's modification of Mallory's phosphotungstic acid hematoxylin and Delafield's hematoxylin-eosin stain. In 1 case No. 6507, alcohol fixed tissues were stained with Best's carmalum for glycogen.

PATHOLOGICAL RENAL CHANGES

Grossly kidneys with well developed gelatin nephrosis are swollen and the cut surfaces tend to bulge. The average weight of 17 otherwise relatively normal kidneys from 10 patients (excluding the kidneys of these patients which showed any neoplastic infiltration) in this series who demonstrated well developed microscopic lesions was 210 grams.

Microscopically the lesions are similar to those described for sucrose nephrosis (Fig. 1)



Fig. Case 6558. The general pattern of the renal lesion in sucrose nephrosis. The patient received 80 cubic centimeters of 50 per cent sucrose solution intravenously 20 hours before death. There is marked acclimation of the convoluted renal tubules. Compare with Figure 3 Hedenbuhl's modification of Mallory's connective tissue stain X 60.

(1-2-14) Variations in the extent and the degree of change can be roughly correlated with the time elapsing between the injection of the gelatin solution and the examination of the kidney and with the amount of gelatin given (Table I). The epithelial cells of the proximal convoluted tubules present a granular finely vacuolated swelling often so severe that the tubular lumens are evident only as slits (Fig. 2). Occasionally the affected cells are necrotic but this change is minimal and the cells are, on the whole, well preserved. In fresh well fixed tissues the brush border remains distinct and is not sloughed. These changes are largely confined to the proximal convoluted tubules and the portions of these tubules which lie in the medullary rays and extend into the renal medulla show the earliest and most pronounced swelling and vacuolization. The distal convoluted tubules may also be affected though to a lesser degree, but the loops of Henle and the collecting tubules remain free from this change even in the severest gelatin nephrosis encountered (Figs. 3 and 4). Best's carmalum stain on the alcohol fixed kidney sections of Case 6507 gave no evidence of glycogen in the hydropic tubular cells.

The lumens of the convoluted tubules and of the glomerular spaces contain much amorphous granular precipitate. This may be indicative of dysfunction, tissue necrosis, or of

the presence of gelatin in the tubular lumens, but its significance is obscured by the fact that such precipitates are routinely encountered in the tubules of otherwise normal kidneys examined at necropsy.

No significant glomerular changes have been noted which are not attributable to other renal changes. Changes such as the leucocyte infiltration and shrinkage of glomerular tufts described by Anderson and Berthia (2) for sucrose nephrosis have not been seen. One case (Case 6412 Fig. 5) having well developed gelatin nephrosis together with a complicating icteric nephrosis, displayed a striking cuboidal epithelial metaplasia of the parietal layer of Bowman's capsule adjacent to the neck of the convoluted tubules. This change is morphologically similar to that which has been described by Anderson and Berthia for sucrose nephrosis and to that which has been described by Bywaters and Dible as occurring in association with the renal lesion of the crush syndrome.

In a number of instances large amounts of gelatin were administered over long periods of time, the greatest amount being 17 600 cubic centimeters administered in 23 doses over a period of 34 days. One case only (Case 6305 Fig. 6) showed moderate focal collobal droplet degeneration of the tubular epithelium. In other instances where varying amounts of gelatin were given but discontinued sufficiently long before death to allow the hydropic swelling to subside (Table I) no changes definitely attributable to the previously existing gelatin nephrosis were demonstrable. The changes seen were such as are routinely encountered in relatively normal kidneys of patients dying with high fever or other generalized disturbances. Only occasional tubules were necrotic displaying pyknotic nuclei and isolated foci of regenerating tubular cells.

FACTORS INFLUENCING THE DEVELOPMENT OF GELATIN NEPHROSIS

Table I summarizes the major findings pertaining to the degree of gelatin nephrosis, the extent of gelatin therapy, other hypertonic intravenous fluids given, and the basic pathological condition of the patient as well as any renal change other than the gelatin nephrosis.



Fig. 2. Case 6206. There is marked hydropic swelling of the illustrated proximal convoluted tubule. The brush border is intact. On the whole the cells are well preserved. Heidenhain's modification of Mallory's connective tissue stain. $\times 655$



Fig. 3. Case 6206. The general pattern of the lesion of gelatin nephrosis in the renal cortex. The proximal convoluted tubules display marked vacuolization; the loops of Henle remain free from such change. Heidenhain's modification of Mallory's connective tissue stain. $\times 160$

It reports all instances of patients receiving gelatin which were encountered in this study.

The most important single factor determining whether or not gelatin nephrosis was present was the time interval between gelatin administration and death. All cases examined within 67 hours of receiving their last gelatin injection showed gelatin nephrosis. No patient expiring more than 120 hours after receiving the last gelatin injection displayed the change. In this connection it is interesting to recall the recent work of Little and Dameron indicating that in dogs given gelatin intravenously only traces of gelatin can be found in the urine after 72 hours. The shortest interval between gelatin administration and death was seen in Case 6317 where the elapsed time was given as 5 minutes in the nursing notes. Though there is basis for questioning the exactness of this figure it is certain that the gelatin was given less than 30 minutes before death. The lesions in this instance were well developed but present only focally in portions of the proximal convoluted tubules lying in the medulla (Fig. 7). The spotty distribution of these lesions is in harmony with recent studies indicating that the individual nephrons each function only part of the time. Their appearance so shortly after the injection of gelatin agrees well with the observation of Little and Dameron that in dogs 50 per cent of the gelatin injected intravenously disappeared from the plasma within 30 minutes.

By the third postinjection hour the proximal convoluted tubules exhibited well developed and widespread lesions. These convoluted tubules then persisted as long as gelatin was administered.

Inspection of Table I reveals that some correlation is possible between the severity of the lesion and the amount of gelatin given in that the severest lesions (4 plus) tend to be present in the instances where the greatest amount of gelatin was given. This correlation is not absolute (see Case 6206) factors of length of postinjection interval and individual variability tending to obscure the picture.



Fig. 4. Case 6206. The general pattern of the lesion in the cortex and medullary rays in gelatin nephrosis. The proximal convoluted tubules show marked vacuolization and many are filled with granular debris. The longitudinal section of a loop of Henle illustrated shows no vacuolization. Heidenhain's modification of Mallory's connective tissue stain. $\times 100$.



Fig. 5. Case 642. Cuboidal metaplasia of the parietal cells of Bowman's capsule. The kidneys showed combined gelatin and ischemic nephrosis. Heidenhain modification of Mallory's connective tissue stain. X200.



Fig. 6. Case 6503. Colloid droplet degeneration of proximal convoluted tubules. 10,650 cubic centimeters gelatin given intravenously in 13 injections in 6 days. Heidenhain modification of Mallory's connective tissue stain. X400.

Rigdon and Cardwell suggested that the state of hydration of the patient is of importance in determining the occurrence of sucrose nephrosis. The material available did not permit an evaluation of this factor in the pathogenesis of gelatin nephrosis. This series is also not sufficiently extensive to permit judgment as to whether or not previous renal disease will enhance the lesion.

EFFECT OF GELATIN NEPHROSIS ON RENAL FUNCTION

No consistent accurate measure of renal function was made on these patients clinically since they did not evince clinical renal dysfunction. The occasional pertinent blood and urine studies recorded gave no substantial evidence of impaired renal function. A careful study of the fluid balance of the patients was made from the clinical records. These studies were frequently complicated by the fact that in most instances the gelatin therapy was begun at the time of operation. Concurrently increased fluid administration and fluid and blood loss through inadequately measured emesis and drainage and from surgical loss of blood often obscured possible changes such as the early diuresis noted by Bridger and associates in dogs receiving intravenous gelatin.

Case 6532 (Fig. 8) demonstrated the most striking change which might possibly be attributed to gelatin therapy. A marked diuresis occurred 12 days after laparotomy on the

third and last day of gelatin administration. This persisted for 6 days and then subsided. The only other intravenous fluid administered during this time was 5 per cent glucose solution and no other medication was given which might be held accountable for the diuresis. Comparable quantities of glucose were given daily from the third postoperative day (14 days before the diuresis developed) through the twenty-second postoperative day (the day the diuresis subsided). A second patient (Case 6542) had a satisfactory urine output of 1000 cubic centimeters on the second postoperative day. On the third day he was given a first injection of 400 cubic centimeters of gelatin solution intravenously. His urine output on this day dropped to 50 cubic centimeters despite a total of 4900 cubic centimeters of intravenous fluid given. On the 2 succeeding days he received a total of 6,650 cubic centimeters of fluid intravenously including 400 cubic centimeters of gelatin but put out only 100 cubic centimeters of urine per day and expired on the sixth postoperative day without having established adequate urine output. The day before his death blood chemistry studies showed serum chloride 108.5 millimoles per liter serum pH 7.32 serum carbon dioxide 18.5 millimoles per liter and blood nonprotein nitrogen of 117.6 milligrams per cent. The only significant lesion in the kidneys at necropsy was gelatin nephrosis. A complicating factor in the interpretation of these findings was the myocardial infarction

TABLE I—SUMMARY OF THE SEVERITY OF GELATIN NEPHROSIS, THE AMOUNT OF GELATIN THERAPY GIVEN OTHER INTRAVENOUS THERAPY EMPLOYED AND THE BASIC PATHOLOGICAL CONDITION OF THE PATIENTS STUDIED

Case No.	Gelatin nephrosis	Interval between last gelatin and death	Total c.c. gelatin given	No. of doses	Total days of gelatin therapy	Other hypertonic fluids	Remarks
Gelatin Given—Gelatin Nephrosis Present							
637	+	5 min.	00			50% glucose	Resected left hypernephroma. Acute dilatation of the stomach. Death 3rd day
637	+++	3 hr.	400			Amigen	Resected esophageal carcinoma. Death 4th day
67	+++	3 hr.	5,200	6		50% glucose	Resected ovarian carcinoma. Peritonitis. Arteriosclerosis. Death 10th day
6306	++++	8 hr.	500			Amigen	Carcinoma of the lip. Coronary thrombosis.
630	++	16 hr.	800		4	Amigen	Resected esophageal carcinoma. Death 4th day
675	+++	6 hr.	1,600	3		none	Resected esophageal carcinoma. Hemorrhage from duodenal ulcer. Death 35th day
6307	+++	16 hr.	1,800	3	3	Amigen	Resected gastric carcinoma. Death 4th day
6445	+++	6 hr.	2,400	3	5	none	Resected carcinoma of cervix. test. Colostomy repair. Fecal peritonitis. Death 4th day
6470	++	4 hr.	1,000	4	6	none	Resected gastric carcinoma. Fecal peritonitis. Death 10th day
6483	++++	4 hr.	11,600	8	30	none	Ligula plastica. Jejunostomy. Pulmonary embolism. Death 7th day
6308	+	30 hr.	400			Amigen	Resected esophageal carcinoma. Death 2nd day
6303	++++	11 hr.	0,630	3	16	Amigen	Gastric carcinoma with carcinomatous peritonitis. Death 3th day
630	++++	43 hr.	1,000	5	4	none	Resected retroperitoneal lymphosarcoma. Renal metastases. Death 9th day
61	+++	30 hr.	800			Amigen	Resected carcinoma of gall bladder. Peritonitis. Icteric nephrosis. Death 7th day
654	+++	67 hr.	800			50% glucose	Resected rectal carcinoma. Myocardial infarction. Death 7th day
634	+++	9 hr.	800			50% glucose	Resected gastric ulcer. Peritonitis. Death 5th day
6337	++	3 days	2,333		30	Amigen	Lymphoblastic sarcoma. Extensive abdominal resection. Right hydronephrosis. Death 34th day
Gelatin Given—No Gelatin Nephrosis							
630		86 hr.	800			none	Resected rectal carcinoma. Death 4th day
633		90 hr.	7,600		5	50% glucose Amigen	Resected duodenal carcinoma. Bronchopneumonia. Death 8th day
640		9 days	17,630	3	24	none	Resected carcinoma of colon. Bronchopneumonia. Death 33rd day
69		45 days	6,663	5	27	none	Resected gastric carcinoma with metastases and emaciation. Death 7th day
6346		days	800			Amigen	Resected pancreatic carcinoma with metastases and emaciation. Death 3th day
6532		17 days	2,400	3	3	none	Resected sarcoma carcinoma. Abdominal carcinomatosis. Death 14th day

*Includes only fluids given within the last 7 days preceding death. Day of death given is the postoperative day

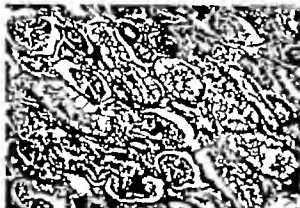


Fig. 7. Case 637. Early focal gelatin nephrosis. There is well developed vacuolization of the convoluted tubules. The patient received 80 cubic centimeters of gelatin intravenously 1/2 hour of his death. Heidenhain modification of Mallory connective tissue stain. $\times 60$.

developing on the third postoperative day. His blood pressure subsequently remained at about 86/60 to 100/80 (preoperative pressure 145/80) till the day of death.

DISCUSSION

Three of the cases presented raise the question of another possible effect of gelatin injection. Case 6306 had suffered from several attacks of indigestion during the past few years. On April 5, 1944 at 2:30 p.m. he was given 800 cubic centimeters of gelatin intravenously. Throughout the following day he had vague abdominal distress and mild substernal pain, felt nauseated and noted excessive sweating. At 2:45 p.m. of this day intravenous injection of 800 cubic centimeters of gelatin solution was begun. After receiving about 200 cubic centimeters he complained of severe substernal pain, became cyanotic and his breathing became shallow. Two hours later he complained of severe epigastric pain boring to the back, his blood pressure was unobtainable and at 10:35 p.m. he expired with extensive myocardial infarction demonstrated at necropsy. Another patient (Case 6542) was found cold and sweating on the morning of his third postoperative day. His blood pressure was 70/60. Saline, blood antigen and 400 cubic centimeters of gelatin solution were given intravenously. Seventeen and a half hours later he was given an additional 400 cubic centimeters of gelatin and 1000 cubic

centimeters of antigen. 67 hours later he expired with extensive myocardial infarction. Both patients had severe coronary arteriosclerosis. The third (Case 6485) developed thrombosis of left iliac vein and artery postoperatively while receiving gelatin and other fluids intravenously and died of pulmonary embolism 24 hours after the last gelatin injection.

Intravenous injection of gelatin is known to produce circulatory changes. Fletcher and associates as well as Holt and Knoefel demonstrated an increase in blood volume greater than the volume of gelatin injected, this apparently being due to the effect of gelatin in drawing additional fluid into the circulation. The former investigators did not note any excessive strain on the cardiovascular systems of their patients or volunteer subjects though they did note a marked increase in cardiac output and a sustained hemodilution. They urged caution in the use of gelatin and other macromolecular substances in chronically ill patients. Handik and Karsner demonstrated pseudoagglutination of erythrocytes in the form of conglutinated thrombi in postmortem sections of a guinea pig receiving 0.5 per cent gelatin intravenously. Ivy and associates noted similar marked pseudoagglutination and an increase in the sedimentation rate in dogs given 5 per cent gelatin solution intravenously. Similar observations on patients have been reported by Kozoll and associates (19, 25). Earlier reports (24) indicated that gelatin given intravenously increases the viscosity and coagulability of the blood. Subcutaneous injections of gelatin have been used in the past to increase the coagulability of the blood in the treatment of aneurysms. Recently Koop and associates following an extensive investigation reported that the clotting time after gelatin infusion is uniformly prolonged in dogs but was unaffected in 6 of 7 patients studied. The seventh patient demonstrated an appreciably prolonged clotting time. Stugmann and associates found no pathological changes in bleeding time, clotting time, or platelet counts of patients given gelatin infusion and Gordon and associates found no postmortem evidence of thrombosis, hemolysis, embolism or capillary damage in dogs given 8 to 10 per cent solutions of gelatin intravenously.

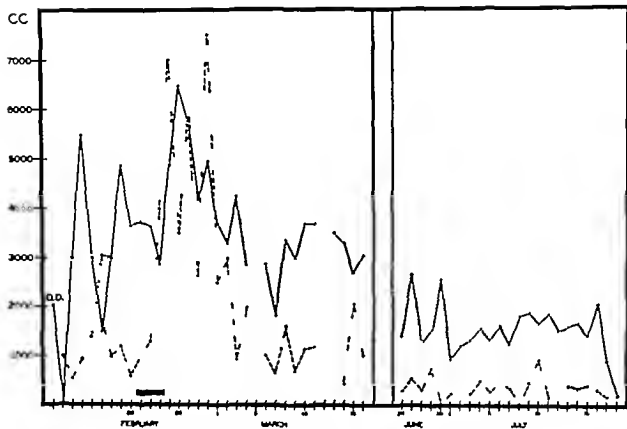


Fig 8. Case 6532 L.B. Fluid balance record. Total Intake \circ — \circ total output, \circ +--+ \circ urine output, \circ --- \circ gelatin given ———

In the light of these reports conflicting though the conclusions sometimes are the 3 cases reported above though not conclusively implicating gelatin suggest the need for caution against the indiscriminate use of gelatin intravenously administered to patients with circulatory disturbances and vascular disease. It may be that some of the conflicting reports may be due to the variability of gelatin preparations. A report by the National Research Council indicates that at least some of the local thrombotic effects reported may be due to added preservatives.

This series of necropsy studies would seem clearly to establish the etiological rôle of gelatin in the production of hydropic swelling of renal tubules. Well developed lesions were found in all postmortem examinations of kidneys of patients receiving gelatin intravenously within 67 hours of the time of death. Hepper found similar lesions in dogs given gelatin solution intravenously. Similar well developed lesions were not found in over 400 consecutive cases studied except in those in

stances in which sucrose therapy had been employed. Minimal lesions were occasionally encountered which corresponded to the minimal lesions seen in some of the patients who had received gelatin so long before death that the residual changes could only be attributed to gelatin by inference. The etiology of these changes was not clearly demonstrated but the changes were such as might be attributed to other intravenous fluids.

The effect of other intravenous fluids was evaluated. Cutler reported finding hydropic changes in the kidneys of patients receiving hypertonic solutions of dextrose (10-15 per cent solutions). Nearly all the patients in our series received dextrose intravenously, some receiving relatively large amounts of 10 per cent solution over long periods. This may in some instances have enhanced the effect of the gelatin but other patients receiving similar amounts of dextrose without concomitant gelatin showed only minimal or equivocal tubular vacuolization. Five of these patients received 50 per cent dextrose intravenously

usually in 1 or 2 doses of 50 cubic centimeters each during the week preceding their demise. No tubular lesions were found. One patient (Case 6233) received 250 cubic centimeters of 50 per cent dextrose during the 48 hours before death but displayed no renal lesion at necropsy. Amigen was frequently administered together with gelatin. A number of control cases receiving amigen without concomitant gelatin failed to demonstrate nephrotic renal changes.

The pathogenesis of gelatin nephrosis is not demonstrated by this study. Wilmer in discussing the mechanism of sucrose damage to the kidneys concluded that this effect was osmotic, the sucrose diffusing into the renal tubular cells and drawing in water. He noted that rats and rabbits phloridzinized to prevent sucrose reabsorption still developed hydropic changes of the renal tubules. It is probable as also suggested by Popper and associates that gelatin nephrosis develops in much the same manner the gelatin arriving in the tubular cells by diffusion or active absorption or both and causing in turn the taking up of water by increased osmotic pressure exerted by the gelatin. The ready reversibility of the change in both cases speaks in favor of this concept.

Though no uniform, clearly demonstrable harmful effects have as yet been attributed to gelatin nephrosis, it is well to bear in mind the growing feeling that the morphologically similar sucrose lesion is not innocuous. Feher and associates reported that in dogs having an initial large renal reserve, no demonstrable effect on the blood nonprotein nitrogen was found when sucrose was injected though the ability of the kidneys to concentrate urine was reduced. In dogs with relative renal excretory insufficiency produced by Goldblatt's method of producing hypertension or by temporarily occluding the renal arteries for 1 hour marked reduction in the ability to concentrate urine and a transient rise in blood nonprotein nitrogen occurred when sucrose was injected intravenously. A report by the National Research Council points out that it is not known whether the use of gelatin will impair functional return to normal in kidneys in sustained ischemia or severe burns or in the crush syndrome. Anderson and Bertha (2) recommend

that sucrose be withheld from patients with renal lesions and state that it should in no instance be given in large or repeated doses. The 2 cases reported as showing diuresis and oliguria in the presence of gelatin injection, warrant a similar caution in the use of gelatin.

SUMMARY

1 The postmortem findings of 23 patients receiving intravenous gelatin therapy who expired as a result of medical and neoplastic disease or from complications of therapeutic surgical measures, are reported as demonstrating the etiologic rôle of gelatin in the pathogenesis of renal hydropic changes morphologically similar to those produced by the intravenous injection of sucrose.

2 The morphology of the renal lesion produced by gelatin is described and compared with that of sucrose nephrosis.

3 Gelatin nephrosis is shown to be a reversible change occurring within half an hour after the intravenous injection of gelatin and disappearing within 120 hours following the last injection.

4 Studies of the effect of the renal lesion on renal function are reported as inconclusive but 2 suggestive cases are discussed one showing diuresis and the other oliguria following the intravenous administration of gelatin. Caution is suggested in the use of this substance in patients exhibiting previous renal impairment.

5 Attention is directed to the possible rôle of gelatin in promoting circulatory disturbances and 3 cases are reported as suggesting gelatin as a potential precipitating factor in coronary occlusion and vascular thrombosis in the presence of circulatory disturbances and vascular disease.

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found to have a duodenal ulcer from which gas escaped into the tissues. Three cases of endometrios were reviewed 2 of the lesions were in the appendix and the other in the ileum.

SUMMARY AND CONCLUSIONS

A general survey of the tumors arising in the gastrointestinal tracts of members of the armed forces between 18 and 38 years of age has been made. The results of this survey as to relative frequency and anatomic distribution is largely summarized in the accompanying tables and charts. These overall figures follow those of previous reports. The most salient features brought out are these:

1. Carcinomas of the large intestine and rectum constituted over three-fourths of all of the carcinomas of the gastrointestinal tract.

2. Carcinomas were most frequent in the older age group but mortality was relatively higher in the younger age group.

3. Polypoid lesions of the intestinal tract were observed most commonly in the rectum.

No recurrences resulted after local excision.

4. Carcinoids occurred most frequently in the appendix, but those in the rectum were commonly confused with carcinomas.

5. The most frequent tumor of the lymphoma group was the benign lymphoid polyp.

These tumors were commonly found in the rectum and local excision was followed by no subsequent evidences of recurrence or transformation into the malignant type.

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were 5 instances of multiple tumors. The granuloma of Hodgkin's disease was in the small intestine and the ileocecal lesion was among the 20 cases of reticulum cell sarcoma and lymphosarcoma, and another in the case of leucemia. Follow up records in the case of Hodgkin's disease were incomplete. Five of the lymphoid tumors were seen in individuals under 21 years of age, 14 in those between 21 and 30 and 3 in those between 31 and 38.

MISCELLANEOUS

Among the less common tumors in this survey there were 7 malignant melanomas, 6 of them metastatic in origin only 1 was believed to have arisen in the ileum. Four neurofibromas were located in the appendix and were discovered at operation for what appeared clinically to be acute appendicitis. One gallbladder carcinoma of the cocoon occurred in a 6 centimeter in diameter. In the instance of benign tumors recorded the lesions were multiple and were located in the ileum. One unusual gastric tumor was a hemangio-pericytoma and undifferentiated sarcoma of the stomach and undifferentiated sarcoma of the jejunum. Lipoma, myxoma, lymphangioma, teratoid and other tumors, sometimes reported to occur in the gastrointestinal tract, were not observed in this series. The reason for this probably lies in the screening system previously described.

There were 8 cysts of the gastrointestinal tract, 4 related to the esophagus and 4 to the small intestine. Three of those in the esophagus were lined by respiratory epithelium and 1 was a parasitic cyst due to ankylostomiasis. Of the 4 in the small intestine the other 3 were enteric cysts lined by columnar epithelium. One mucocle was seen in the rectum it was associated with a polyp. Of interest, too was a case of pneumatoxis cystoides intestinalis for which a segment of ileum was resected. The patient was subsequently

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SODIUM PENTOTHAL ANESTHESIA FOR SELECTED VAGINAL OBSTETRICS

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In order to complement local anesthetics, we scanned the field for an anesthetic agent with reasonable safety whose technique of administration could be mastered with little extra instruction whose contraindications were few and which might be administered to private patients in view of the fact that relatively very few of our private physicians ever used local anesthetics even though adequate equipment for its use was immediately available. One of us (A. L. D.) had employed intravenous sodium pentothal anesthesia routinely for minor and for selected major gynecological operations for a number of years and had observed its routine use for vaginal obstetrical deliveries. The choice of this drug as an anesthetic agent for selected vaginal obstetrical deliveries has proved most gratifying to both house staff and private physicians although none of the latter early employed it with milking.

Sodium pentothal is a barbiturate which differs little in chemical structure from pentobarbital sodium (nembutal) sodium amytal and crystal soluble being most like nembutal. Induction of anesthesia is incredibly short and quick, the patient generally being unconscious within 20 to 30 seconds and ready for surgery within a minute after the first few cubic centimeters of solution have been administered into the vein. Vomiting during or after its administration is rare. Recovery is rapid to 3 hours after anesthesia depending in large measure upon the amount of premedication. There is seldom any hang over reaction. It is rapidly destroyed in the body probably by the liver although Lundy (10) has suspected it in the urine. It does not have any effect upon the blood chemistry except for a practically negligible elevation of blood sugar. The blood picture is unaltered and metabolism unaffected. It produces a moderate respiratory

The use of intravenous sodium pentothal in obstetrics is not new. Several literature during the past 10 years (3, 5, 8, 9, 12, 14) Some have employed it as the sole or major anesthetic agent routinely or almost routinely in obstetrics (3, 8, 12) whereas Labrecque reserved it for use in cases with severe upper respiratory infection bronchitis, asthma, tuberculosis, bronchiectasis, and after ingestion of large meals. Hunt and Lundy employ it in connection with local infiltration for cesarean section withholding the use of pentothal until the abdomen has been entered and the operator is ready to proceed with incision of the uterus and immediate extraction of the fetus. Several (8, 9) contend that it is an unsatisfactory anesthetic agent for podalic version with extraction on the grounds that the relaxation which it produces is inadequate. Hellman (5) and Rucker (11) do not agree with this contention in view of the fact that 1.5 per cent of Hellman's operative deliveries and 7.3 per cent of Rucker's deliveries involving a viable infant were effected by this method.

Our use of intravenous sodium pentothal during World War I because of the shortage of anesthetics available for routine ward deliveries. It had been immediately preceded by essentially routine use of perineal block anesthesia. Originally open drip ether was given by various untrained hospital employees, but this was abandoned after the occurrence of a serious case of vomiting under ether anesthesia followed by aspiration pneumonia which necessitated hospitalization of the patient for almost 3 months. That older members of the staff could not recall other similar tragic or near tragic cases is truly remarkable.

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depression with anesthetic dosage but this is not alarming. Pentothal will effect an elevation of blood pressure particularly systolic but the elevation is not sustained though the immediate systolic rise may amount to as much as 20 millimeters of mercury (8). It leaves the pulse unaffected or somewhat slower. Other pharmacological characteristics have no clinical bearing. Laryngospasm is frequently mentioned as an effect of intravenous sodium pentothal anesthesia but actually appears to be rather uncommon more particularly when its use is preceded by a hypodermic of atropine or of hyoscine.

Intravenous sodium pentothal rapidly traverses the uteroplacental barrier to depress fetal respiratory movements and to retard the initiation of respirations in the newborn. Hellman, Shettles, and Stran (4) found that within 10 or 12 minutes it reaches equal concentrations in fetal and maternal blood. They found that during the first 5 minutes after beginning the anesthetic, little of the drug reached the fetus. Dresbach and Snyder showed that when the experimental rabbit was given 10 milligrams of pentothal intravenously per kilogram of body weight at term, the fetal respiratory rate was decreased to one-third the initial rate for a period of about 5 minutes, and that after a total dose of 3 to 5½ times the above amount there was relatively little cumulative effect upon the fetus. In this connection it should be pointed out that the above smallest experimental dose is comparable to the average total dose used in our series.

It has been suggested that intravenous sodium pentothal should be avoided as an anesthetic in certain toxemia patients because of the presumed destruction of the drug by the liver and the possibility of added degenerative changes in that organ (11). The frequent moderate elevation in systolic blood pressure might also be used as an argument against its use in connection with the severe hypertensive toxemias of pregnancy. However, Rucker (13) seems not to have considered this maternal complication as a serious contraindication to its use. In general, however, there seem to be few valid contraindications to its use in obstetrics. It is conceded that pentothal with

its respiratory depressant effect is undesirable in heart disease with decompensation with marked anemia, in the face of dyspnea attributable to pathological processes in the thorax or if there is any reason to think that the respiratory passage is, or may become obstructed. It is ideal that the stomach should be empty in order to eliminate vomiting. Also pentothal is known to increase laryngeal reflexes and vomiting would then tend to increase the incidence of laryngospasm. There are individual idiosyncrasies to pentothal but these are surely uncommon. Hunter has reported a case with cutaneous manifestations in the form of erythema multiforme followed by pustule formation and pyrexia when the anesthetic was later repeated. It goes without saying that the solution should be injected intravenously and not into the extravascular tissues nor into the arterial tree. Lundy (10) records several cases of intra arterial injection of sodium pentothal. All of these patients experienced varying amounts of pain in the injected arms. One of these succumbed to an overdose of pentothal. The induction of anesthesia in this case was prolonged with an excessive amount administered. Death followed the delayed entrance of the overdose of the drug into the general vascular system via the arterial as compared with the intravenous route. Lundy advises the use of an intermittent tourniquet to the affected arm and oxygen inhalation whenever a large amount of the drug is administered intra arterially. Dixon and Lundy (10) have indicated that 10 per cent concentrations of sodium pentothal injected into the perivenous or subcutaneous tissues produce pain and irritative manifestations, sometimes even with sloughing of tissue but Jarman claims that 5 per cent solutions are almost innocuous when injected into these tissues and that it is unusual for these patients to complain of even a sore arm. Lundy (10) says that thrombosis was frequent with 10 per cent solutions but that its incidence has been reduced in proportion to the reduction in concentration of the drug.

Between July 24 1945 and October 1 1946 350 patients from both ward and private services of the Hermann Hospital were delivered of viable pregnancies under intravenous so-

TABLE I.—ANALYSIS OF 350 PATIENTS DELIVERED UNDER INTRAVENOUS SODIUM PENTOTHAL ANESTHESIA ACCORDING TO DEPARTMENTAL AFFILIATION AND RANK OF ANESTHETIST

Department	No. patients	Per cent
Obstetrical staff	330	94.3
Resident	256	
Interns	93	
Visiting	1	
Anesthesia staff	20	5.7
Resident or Interns	19	
Professional anesthetist	1	
Totals	350	100.0

Race and economic level, the latter determined from admission status, of each patient in the series will be seen in Table II. The hospital has no accommodations for private colored obstetric patients. The distribution between the races for both ward and private patients is roughly the same as for these services as a whole. Sixteen private physicians delivered patients under intravenous sodium pentothal anesthesia but 9 of these can be considered casually for each accounted for a maximum of only 3 deliveries. This does not mean that the 9 tried and discarded pentothal for short vaginal delivery but that their number of deliveries over the period of time under consideration was correspondingly low. Thirty was the maximum number of deliveries accounted for by any one private physician.

Age of patient is recorded in Table III. Since there was no selection of patients for pentothal anesthesia on the basis of age, the observed age distribution is essentially the same as for the service as a whole. Two patients were less than 15 years old actually each was 14 when delivered.

Mention has already been made of the departmental policy of preferring no analgesia

TABLE II.—RACE AND ECONOMIC LEVEL OF 350 PATIENTS DELIVERED UNDER INTRAVENOUS SODIUM PENTOTHAL ANESTHESIA

Race and economic level	No. patients	Per cent
Ward colored.	128	62.3
Ward Mexican	44	
Ward white	46	
Private white	130	
Private Mexican	2	37.7
Totals	350	100.0

TABLE III.—AGE DISTRIBUTION OF 350 PATIENTS DELIVERED UNDER INTRAVENOUS SODIUM PENTOTHAL ANESTHESIA

Age, years	No. patients	Per cent
15 or less	4	1.1
16-19	69	19.7
20-24	125	35.7
25-29	76	21.7
30-34	42	12.0
35-39	30	8.6
40-43	4	1.1
Totals	350	99.9

and local infiltration anesthesia for the handling of premature labor and delivery. There were however 7 premature births in this series. Two of these involved intrapartum fetal death due to premature separation of the normally implanted placenta, each at 30 weeks gestation. The remaining 5 premature deliveries advanced to 34 weeks (1 case) and 35 weeks (4 cases) gestation were effected with dispatch so that the premature infants with birth weights ranging from 4 pounds 6 ounces to 5 pounds 3½ ounces were born without narcosis, required no resuscitation and were all raised. The remaining 343 (98%) gestations produced near term term, and postmature fetuses, i.e. each newborn was at least technically of term size—weighed at least 2500 grams (5½ pounds).

Table V reveals that there was no selection of patients in regard to previous obstetrical experience. Fifty three per cent were multiparas, only 4 being in the grande multipara range. One of the essential primiparas had had 6 previous abortions, 2 had had 2 each and 14 had each previously aborted once. There were 4 young primiparas, i.e. patients delivering a term or near term pregnancy before the sixteenth birthday anniversary. They

TABLE IV.—ANALYSIS OF 350 PATIENTS DELIVERED UNDER INTRAVENOUS SODIUM PENTOTHAL ANESTHESIA ACCORDING TO DURATION OF GESTATION

Weeks' gestation	No. patients	Per cent
30-32	3	0.6
33-35	5	1.4
36-37	51	14.6
38-39	106	30.3
40-41	152	43.4
42-44	34	9.7
Totals	350	100.0

TABLE V.—ANALYSIS OF 350 PATIENTS DELIVERED UNDER INTRAVENOUS SODIUM PENTOTHAL ANESTHESIA ACCORDING TO PARITY

Parity	No patients	Per cent
Primiparae	147	42.0
Essential primiparas	7	4.9
Multiparas	56	53.1
previous viable births—08		
2 previous viable births—47		
3 previous viable births—4		
4 previous viable births—8		
5 previous viable births—5		
7 previous viable births—		
8 previous viable births—		
9 previous viable births—		
Tals	35	100.0

were all ward patients, 1 being a Mexican 15 years old and 3 colored one 15 years, and two 14 years of age. Four patients were true elderly primiparas, i.e. were delivered of the first viable pregnancy after the thirty-fifth birthday anniversary. One of these was a 39 year old private white woman and the others colored patients 36 to 39 years of age. Five were elderly essential primiparas or were delivered of the first term or near term pregnancy after age 35 but in each instance the viable pregnancy had been preceded by 1 or more abortions. Four of these were white private patients each of whom had had 1 previous abortion the oldest was 42 years of age 1 colored elderly essential primipara was 37 years old and had had 2 previous abortions.

The various primary fetal presentations and positions are recorded in Table VI. Manual

TABLE VI.—ANALYSIS OF 350 PATIENTS DELIVERED UNDER INTRAVENOUS SODIUM PENTOTHAL ANESTHESIA ACCORDING TO PRIMARY FETAL PRESENTATION AND POSITION

Presentation or position	No patients	Per cent of total
L. O. A.	58 (a)	44.9
L. O. T.	31	6
L. O. P.	24	6.8
R. O. A.	75 () (b)	3
R. O. T.	10	4.5
R. O. P.	43	37
Breech.	11	3.1
Face	3	0.6
Transverse	1	0.3
Compound	1 (b)	0.3
Totals	35	100

(a) Twin pregnancy (b) Represents fetus.

or forceps rotation from an occiput transverse or posterior to an anterior was employed 35 times.

In Table VII it will be seen that 110 fetuses (31.3%) were delivered spontaneously under intravenous sodium pentothal anesthesia. This figure is almost identical to that reported by Eastman (1) whereas Rucker (13) reports only 8.3 per cent spontaneous deliveries when a viable infant was involved. LaBrecque reports the highest incidence of spontaneous delivery namely 57 of 80 deliveries (71.2%), with the use of either sodium pentothal or evipal soluble. In this connection it must not be forgotten that pentothal will efface bearing down efforts in 60 per cent of the patients anesthetized with it whereas evipal does not unfavorably affect this reflex mechanism (9). The low incidence of podalic version and of midforceps delivery in the current series reflects the conservatism of the service. The version and extraction was performed on the patient with transverse presentation of the fetus and prolapse of the umbilical cord. One midforceps delivery was used for delivery of a second twin while the other 2 midforceps deliveries occurred on the private service. Perineorrhaphy for correction of a previously noted

TABLE VII.—ANALYSIS OF 350 PATIENTS DELIVERED UNDER INTRAVENOUS SODIUM PENTOTHAL ANESTHESIA ACCORDING TO METHOD OF DELIVERY OF FETUS AND FATE OF THE PERINEUM

Method of delivery	No patients	Per cent
Spontaneous delivery		31.3
With episiotomy	54	
With perineal tear		
With perineal tear	5	
Without perineal tear	40	
Low forceps delivery		20
With episiotomy	205 (a)	
With 1 st perineal tear	4	
With 2 nd perineal tear	4	
With 3 rd perineal tear		
Without perineal tear		
Breech extraction		1
With episiotomy	9	
With perineal tear		
Without perineal tear	1	
Podalic version extraction without tear		1
Midforceps delivery with episiotomy		0.3
Tals	351	100

(a) Includes one of set of twins.

TABLE VIII.—ANALYSIS OF 350 PATIENT DELIVERIES UNDER SODIUM PENTOTHAL ANESTHESIA ACCORDING TO RANK OF ACCOUCHEUR

Rank of accoucheur	No. patients	Per cent
Rotating Interns	130	37.1
Resident obstetrician	87	24.9
For private physician	1	
With aid of staff physician	2	
Private obstetrician	133	38.0
Private patients	131	
Ward cases	2	
Totals	350	100.0

rectocele was performed in connection with 8 private deliveries. One vaginal and 2 cervical tears were known to have occurred with low forceps delivery and all were repaired under pentothal anesthesia. Forceps to the after coming head were applied in 5 instances. Mauriceau maneuver being employed in the other 6 breech deliveries.

The accoucheur for each delivery is recorded in Table VIII. Only 2 ward deliveries were not actually effected by the house staff—the version with extraction and a difficult low forceps due to an excessive-sized fetus with erythroblastosis associated with a contracted pelvis.

As previously stated, a 2 per cent solution of pentothal was administered intravenously. The amounts of the drug employed are shown in Table IX. Unfortunately the amount used was not recorded in 100 (28.6%) of the cases. Of the remaining 250 in which the exact amount administered is known only 21 (8.4%) received more than 50 cubic centi-

TABLE IX.—ANALYSIS OF 350 DELIVERIES UNDER INTRAVENOUS SODIUM PENTOTHAL ANESTHESIA ACCORDING TO AMOUNT OF DRUG EMPLOYED IN 2 PER CENT SOLUTION

Amount, cubic centimeters	No.	Per cent of total	Per cent of recorded
10 or less	4	1.1	1.6
11 to 30	33	9.4	13.2
31 to 39	56	16.3	14.4
41 to 49	77	22.0	30.8
51 to 59	79	22.6	31.6
61 to 69	5	1.4	2.0
71 to 79	6	1.7	2.4
81 to 89	6	1.7	2.4
91 to 99	1	0.3	0.4
101 to 109	1	0.3	0.4
Above 100	1	0.3	0.4
Not recorded	100	28.6	
Totals	350	100.0	100.0

meters (10 gm.) The largest amount given 135 cubic centimeters (27 gms.) was for the Mexican woman with a contracted pelvis and an excessive-sized erythroblastotic, stillborn (intrapartum death) delivered by prolonged and difficult low forceps extraction. She had received little analgesia. Spontaneous delivery without perineal repair was effected once with only 6 cubic centimeters of solution and a breech extraction of a stillborn premature (intrapartum death) without repair in another instance with 8 cubic centimeters. The average for the series was 39 cubic centimeters (0.78 gm.) In large measure, the amount of anesthesia varied with the amount and recency of administration of analgesia, but such correlations cannot be graphically shown by usual methods. However the various analgesic drugs with time interval between last dosage and moment of birth of the child are recorded in Table X. Of interest are the great variety of drugs and combinations of these used to obtain analgesia. It was rather surprising to discover that 182 patients, 58.7 per cent of those receiving analgesia, received the last dose of the analgesic less than 2 hours before delivery of the infant. Obviously this fact must be remembered when noting the

TABLE X.—ANALYSIS OF 350 DELIVERIES UNDER SODIUM PENTOTHAL ANESTHESIA ACCORDING TO ANALGESIC DRUGS GIVEN AND TIME INTERVAL BETWEEN LAST ANALGESIC DOSE AND BIRTH OF INFANT

Analgesic drugs administered	No. patients	Per cent	Time from last dose to delivery	
			Range, min.	Average, min.
Demerol and hyoscine	5	1.4	10 to 465	80
Demerol alone	80	23.0	10 to 2400	30
Demerol with secobarbital, or luminal	14	4.0	30 to 650	98
Pantopon or dilaudid with secobarbital or luminal	20	5.7	30 to 90	35
Phenobarbital or luminal	6	1.7	80 to 2000	180
Secobarbital or luminal	1	0.3	30 to 465	205
Hyoscine with secobarbital or luminal	1	0.3	30 to 75	33
Codeine or morphine		0.3	140 to 440	240
None	40	11.4		
Totals	350	100		

TABLE XI.—ANALYSIS OF 14 DELIVERIES UNDER INTRAVENOUS SODIUM PENTOTHAL ANESTHESIA ACCORDING TO SUPPLEMENTARY ANESTHESIA EMPLOYED

Perineal block for episiotomy repair	3
Following use of 1 gm. l. pentothal	4
Perineal block	2
Open ether	
Nitrous-oxide	
For partial spontaneous breech delivery	
Perineal block	
Nitrous-ether	
Ether until arrival of anesthetist	
Nitrous adjuvant experiment	1
Ether after extra course pentothal	1
Vomiting under pentothal	1
Finished with perineal block	
Finished with cyclopropane	1

dosage of anesthesia required. It must also be remembered as a factor in the production of apnea in the newborn infant.

As will be seen in Table XI 14 patients (4.0%) received supplementary anesthesia. In addition to these perineal block was the original anesthetic agent which was abandoned for intravenous sodium pentothal when the patient was declared too unco-operative (2 cases) when an unfavorable fetal position was discovered at vaginal examination (3 cases) and when 1 delivery was unduly prolonged due to fetopelvic disproportion. Actually the supplementary anesthesia given was rarely the result of failure of pentothal anesthesia. For example, one accoucheur was so suspicious of pentothal that he effected delivery (3 cases) under it but completed perineal repair under local infiltration. In 4 cases supplementary anesthesia was used in order to avoid preparation of a second gram of pentothal solution. In another instance the resident experimented with nitrous oxide as an adjuvant to pentothal. In the final analysis, then, intravenous sodium pentothal was seriously or majorly complicated in only 3 instances, an incidence of 0.86 per cent. In the first of these the drug itself cannot be blamed for it was admitted into the tissues outside the venous system. Moreover in the other 2 there is reason to suspect that better control of the sodium pentothal anesthetic or of vaginal manipulation might have avoided complications, for in one the patient is said to have been hard to manage under pentothal. In other words, de-

livery was effected or at least attempted without obstetrical anesthesia, while the other vomited after delivery of the child, a time when the original dose frequently wears off. The latter patient swallowed so much air that Wangenstein suction had to be employed 8 hours later.

The case of the patient receiving extravenous injection of sodium pentothal warrants more detailed presentation. She was a 26 year old secundipara with a normal pregnancy at term who was given demerol (100 mgm.) and hyoscine (gr 1/150) both intravenously 2 1/4 hours before delivery and demerol (100 mg) subcutaneously 1 hour before delivery. Anesthesia was attempted with the usual 2 per cent solution of sodium pentothal. After the injection of 30 cubic centimeters with no apparent anesthetic response from the patient, open drip ether was substituted. The intravenous needle had apparently perforated both vein walls with the pentothal injected beneath a fascial plane since blood had initially been drawn back into the syringe and there was no tumefaction in the subcutaneous area. After an episiotomy had been done and the child delivered by low forceps extraction, it was noted that the patient's respirations were mildly depressed. The child was in good condition. The episiotomy was repaired without further administration of an anesthetic. The mother's respiratory depression was apparently from absorption of pentothal but was combated with coramine. She slept for 3 hours after delivery. Some 14 hours later the patient complained of pain in the right arm and several areas of hyperemia were noted near the site of venipuncture. There was little swelling in this area and the corresponding ulnar pulse was normal. Hot moist applications to the affected area were continued for 3 days when the arm became comfortable and there was apparently no residual effect from this accident. As previously noted, cases of this kind followed by irritative symptoms, even sloughing of tissue, are known to occur with 10 per cent solutions but not with concentrations of pentothal not in excess of 5 per cent.

Complications of pregnancy labor and the puerperium are listed in Tables XII XIII and XIV respectively. It will be noted that

TABLE XII.—ANALYSIS OF 350 DELIVERIES UNDER INTRAVENOUS SODIUM PENTOTHAL ANESTHESIA ACCORDING TO COMPLICATIONS OF PREGNANCY

Complication	No. patients	Per cent
Contracted pelvis	59	14.3
G. C. F.	6	
Funnel typical	18	
G. C. T.	23	
G. C. R.	2	
Simple flat	1	
Toxemia	63	18.0
Pre-eclampsia, mild	27	
Pre-eclampsia, severe	34	
Arteriosclerosis	1	
Arteriosclerosis with superadded pre-eclampsia	1	
Anemia, due to iron deficiency	10	2.9
Ascari infection (with anemia)	1	0.3
Heart disease (class II)	2	0.6
Prolonged pregnancy	1	0.3
Syphilis	11	3.1
Primary	1	
Latent, Wassermann pos	7	
Latent, Wassermann neg	3	
Myomata uteri	4	1.1
Rectal stricture	1	0.3
Cystocele and/or rectocele	6	1.7
Hemorrhoids	3	0.6
Condylomata acuminata	1	0.3
Multiple, twin (double ovum)	1	0.3
Adenoma of breast	1	0.3
None	196	56.0
Totals	350	100.0

TABLE XIII.—ANALYSIS OF 350 DELIVERIES UNDER INTRAVENOUS SODIUM PENTOTHAL ANESTHESIA ACCORDING TO COMPLICATIONS OF LABOR

Complication	No. patients	Per cent
Premature rupture of membranes, spontaneous	40	1.4
Intrapartum fever	4	1.1
Induction of labor	13	3.7
Medical	7	
Membrane rupture	11	
Precipitate labor	16	4.6
Prolonged labor	10	2.9
Eclampsia	1	0.3
Pneumonia	1	0.3
Premature separation placenta	2	0.6
Prolapse of umbilical cord	1	0.3
Excessively sized fetus	13	3.7
Low implantation of placenta	1	0.3
Adherent placenta (manual removal)	5	1.4
Hematomata of vagina	1	0.3
Third degree perineal laceration	1	0.3
Cord around fetal neck	62	17.7
Once	31	
Twice	8	
Thrice	3	
True knot in cord	2	0.6
None	172	49.1
Totals	350	100.0

TABLE XIV.—ANALYSIS OF 350 DELIVERIES UNDER INTRAVENOUS SODIUM PENTOTHAL ANESTHESIA ACCORDING TO COMPLICATIONS OF PUERPERIUM

Complication	No. patients	Per cent
Puerperal morbidity	39	11.1
Puerperal infection	27	
Pyelitis	8	
Mastitis (?)	3	
Scarlet fever	1	
Sterilization	10	2.9
Hemorrhage	4	1.1
Premature separation placenta	2	
With uterovag. pack	1	
With pack of vagina	1	
None	297	84.9
Totals	350	100.0

56 per cent of the patients had no complication of pregnancy 49 per cent had none in labor and 85 per cent none in the puerperium. Moreover 105 patients or 30 per cent, had normal pregnancies, labors and puerperia.

Intravenous sodium pentothal anesthesia as noted previously does not affect uterine contractility or contractions. The average estimated blood loss in this series of deliveries was 168.4 cubic centimeters and the distribution of estimated blood loss is recorded in Table XV. In order to ascertain whether estimated blood loss varied with anesthetics other than pentothal 100 consecutive cases were reviewed of patients delivered in the same period of time, under other anesthetics but by the same group of accoucheurs who had used intravenous sodium pentothal anesthesia. No statistical difference could be found in any anesthetic group nor in any group of accoucheurs—rotating internes residents or private physicians. Local caudal spinal saddle block and various inhalation anesthetics and combinations thereof except chloroform were included in this differential study. It seems safe to say therefore that intravenous sodium pentothal anesthesia does not increase blood loss in the placental stage. Neither does it appear to decrease the amount of bleeding in that stage.

It is not easy to evaluate the amount of resuscitation required by a group of newborn infants delivered by a heterogeneous group of physicians and house officers since some employ oxygen vitamin K coramine, or even a

TABLE XV—ANALYSIS OF 350 DELIVERIES UNDER INTRAVENOUS SODIUM PENTOTHAL ANESTHESIA ACCORDING TO ESTIMATED AMOUNT OF BLOOD LOSS

Estimated blood loss, cubic centimeters	No. patients	Per cent
to 50	6	33-
5 to 100	65	47
10 to 200	49	4.0
250 to 400		3.4
500		0.3
800	1	0.01
Not estimated	4	1
Totals	150	99.9

mechanical resuscitator if the newborn child does not cry vigorously and promptly after delivery. However it was found as shown in Table XVI that 270 or 77 per cent of these newborns required no resuscitation whatsoever i.e. cried or at least breathed regularly and promptly after delivery. Forty four or 12.5 per cent required little or only slight resuscitation. In these aspiration of mucus or amniotic fluid was followed by mild cutaneous stimulation in the form of rubbing the back or thumping the toes or fingers. Pure oxygen was administered to 9 of these but in each instance it is stated that resuscitation was of minor importance. That pentothal was responsible for apnea in these is far from proved. Actually in one the drug could not have played a rôle for the child was born before the patient could be completely anesthetized. However in 9 instances the newborn is said to have been mildly narcotized in 2 there was a loop of umbilical cord about the fetal neck in 1 mild cyanosis, in 2 much aspirated amniotic fluid and in the remaining 30 there was no recorded or recognizable reason for the mild initial apnea. Analgesic drugs appear to be involved especially in the light of their frequent administration late in labor. However all the above 314 newborns (89.5%) requiring little or no resuscitation were actually born alive in good condition and survived the immediate neonatal period with a single exception—1 requiring no resuscitation, found dead in its crib 6 hours after delivery believed to have suffocated in which autopsy revealed only adrenal hemorrhage.

There remain 37 infants, 10.5 per cent of the series, in which minor degrees of resuscitation were inadequate. All but 1 of the infant

TABLE XVI—ANALYSIS OF 351 NEWBORN INFANTS FROM 350 DELIVERIES UNDER INTRAVENOUS SODIUM PENTOTHAL ANESTHESIA ACCORDING TO AMOUNT OF RESUSCITATION REQUIRED IN EACH

Resuscitation required	No. patients	Per cent
No resuscitation required	270	77.2
Slight or little resuscitation required.	44	12.5
Narcosis	9	
Loop of cord about neck	2	
Cyanosis		
Aspirated amniotic fluid	2	
Cause unknown	10	
Moderate resuscitation required	2	6.0
Analgesia	7	
Premature complicated delivery	1	
Cyanosis, cause known	1	
Analgesia, cord about neck	4	
Premature, intrapartum infection		
Erythroblastosis	1(b)	
Traumatizing delivery	1	
Pre-eclampsia		
Pentothal 6 mg. s. midforceps	1	
Unknown cause	3	
Considerable or much resuscitation required	12	3.4
Analgesia	3	
Aphylia, unknown cause	2	
Analgesia, premature	1	
Analgesia, fetal distress	1(c)	
Cord about neck fetal distress	1(d)	
Long labor pre-eclampsia	1	
Traumatizing delivery	1(e)	
Intrapartum death—stillborn, nonmacerated	3	9
Premature separation placenta	2	
Prolapsed cord—transverse presentation		
Antenatal death—stillborn, macerated	1	0.3
Erythroblastosis	1	
Totals	351	100.0

(a) Has found dead in crib, believed suffocated at age 6 hours.

(b) Lived 6 hours.

(c) Delivered by cesarean 70 minutes before delivery, cord around neck, passed much mucus, stained amniotic fluid, lived 14 hours.

(d) One of those received no analgesia, admitted directly to delivery room, had aspirated much mucus, stained amniotic fluid, lived 6 hours.

(e) Breach broken up, contracted pelvis, forceps to deliver head, live female, lived 14 hours.

(f) Difficult breech extraction, excessive anal fetor (no Rx. to see), live female, no autopsy (severe hemorrhage).

deaths are included in this group. The apparent causes for major degrees of resuscitation or of fetal loss are included in Table XVI. In no case did sodium pentothal *per se* appear to play any serious rôle in resuscitation or in survival of the newborn. The most serious effect of pentothal in this series was noted in a second twin delivered by midforceps extrac-

STREPTOMYCIN THERAPY IN URINARY TRACT INFECTIONS

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DATA on 465 patients with urinary tract infections in United States Army hospitals receiving streptomycin therapy have been assembled and submitted to critical analysis. The results of this study are presented in this communication.

Urinary tract infections constitute a serious problem in Army hospitals. The reasons for this are manifold.

1 The number of patients with paraplegia in whom ascending urinary infection is a constant threat and a serious complication.

2 Infections in patients with wounds or injuries involving the urinary system including perforations of the bladder, cicatricial deformities of the ureters, and injuries to the genitalia and kidneys. In this group of patients cystotomies and instrumentations have resulted in or were followed by stubborn and unyielding infections.

3 Infections in otherwise healthy individuals due to the usual causes of stasis and obstruction.

4 Infections superimposed upon new growths.

5 The fact that no specific agent has been available hitherto for infections due to *Pseudomonas aeruginosa* and *Streptococcus fecalis*.

6 The inconstant responses, with drug fastness frequently ensuing in many cases of gram-negative bacillary pyuria treated with sulfonamides.

Penicillin is of no value in the treatment of infections due to gram-negative bacilli. Older drugs such as mandelic acid have well known limitations. The need of a potent drug which is effective against bacteria causal of infection in the urinary tract is only too well appreciated.

This project was carried out as a part of the study being made under the direction of the Army Medical Research and Development Board, Office of The Surgeon General.

From the Surgical Research Unit, Brooke General Hospital.

Early reports (7) and our own observations (6) indicated that streptomycin has a potent *in vitro* action on many gram negative as well as gram positive bacteria including the acid fast bacilli. Among these are *Pseudomonas aeruginosa*, and *Streptococcus fecalis* usually refractory to other drugs. We demonstrated (6) that doses of 0.4 gram of streptomycin administered intramuscularly every 4 hours produces levels in excess of 1 milligram (1000 units) of the drug per cubic centimeter of urine and maintains a blood serum level of 16 micrograms (units) per cubic centimeter. These levels are in excess of the amount of antibiotic required to inhibit the growth of 87 per cent of the bacteria usually recovered from infected urine. A preliminary report of the effect of streptomycin therapy in infections of the urinary tract has already been published (5).

RESULTS OF THERAPY

1 *Criteria* The results of treatment with streptomycin have been catalogued according to (1) clinical response, and (2) bacteriological result. The evaluation of clinical response is based on changes in symptoms and fever and the gross and microscopic alterations of the urine. Those patients obtaining complete relief of symptoms and repeated sterile urine cultures are considered 'cured'. Those with remission of symptoms in whom the urine was grossly cleared, but with cultures remaining positive are classed as improved while those with continuing pyuria and no symptomatic relief constitute failures.

In classifying the bacteriological results a "cure" signifies sterile urine cultures for the period of observation (usually 2 weeks after cessation of therapy) while a "failure" denotes a urine culture which continues to show pathogenic bacteria. In some instances sterile urine cultures were obtained within 24 to 72 hours after the institution of therapy, but sub-

tion whose mother had been anesthetized for 16 minutes before this co-twin was born. The newborn was obviously narcotized and required moderate resuscitation but survived and was apparently undamaged. One could hardly expect ill effects upon the newborn with delivery planned to be completed within 8 minutes of induction of pentothal anesthesia. The records are not adequate enough to show the time interval between induction of anesthesia and delivery of the child but it is believed that 8 minutes was rarely exceeded and most often not nearly approached.

In the series, there were 10 infant deaths for an uncorrected total fetal mortality rate of 2.86 per cent. The infant mortality rates at Hermann Hospital for 1945 and 1946 during which years the sodium pentothal series was obtained are compared in Table XVII with figures from the current series. Since there was a certain amount of selection in the pentothal series, the infant mortality rates are not exactly comparable to the rates for the individual calendar years.

Of the 10 infant deaths in this series 4 were stillborn. Only 1 was macerated, antenatal death occurring in a prolonged pregnancy with an excessive sized erythroblastic fetus while the remaining 3 intrapartum deaths were due to premature separation of the normally implanted placenta (2 cases) and to prolapse of the umbilical cord associated with transverse presentation of the fetus.

One of the 6 neonatal deaths has already been mentioned in connection with resuscitation the child being born alive in apparently good condition requiring no resuscitation and 6 hours later being found dead in its crib presumably due to suffocation. In 1 instance, the patient was admitted directly to the delivery room and immediately delivered, without analgesia, by low forceps extraction. The umbilical cord was once around the fetal neck, the fetus had aspirated meconium and survived 6 hours. Another was delivered by easy low forceps extraction with poor application of the forceps. Demerol and hyoscine had been given 70 minutes before delivery, much meconium had been passed in the terminal part of the first stage of labor, the umbilical cord was once around the fetal neck and the

TABLE XVII.—INFANT MORTALITY RATES IN 350 CASES DELIVERED BY INTRAVENOUS SODIUM PENTOTHAL ANESTHESIA COMPARED WITH THE HOSPITAL'S RATES FOR 1945 AND 1946

	Year 1945 per cent	Year 1946 per cent	Current series per cent
Total gross fetal mortality	4.66	4.50	2.86
Total stillborn mortality	56		4
Total neonatal mortality		44	7

child lived only 3½ hours. It appears that in these 2 cases the loop of cord about the fetal neck was responsible for fetal distress, yet in 4 other instances its presence was associated with moderate resuscitation in 2 with the necessity for little resuscitation whereas in 54 more such instances the child required no resuscitation and was born alive in good condition. One child with serious erythroblastosis fetalis succumbed 12 hours after delivery. The remaining 2 neonatal deaths are attributable to traumatizing delivery by breech extraction. One weighed 10 pounds 10 ounces, required a long and difficult extraction, lived 9 hours, and at autopsy showed cerebral hemorrhage. The final case was one of breech position in which the breech was decomposed with difficulty and extracted. This child lived only 5 hours and autopsy showed atelectasis and confirmed the fracture of one leg. There is no reason to assume that pentothal anesthesia was in any way the cause of any of these infant deaths.

There were no maternal deaths.

In conclusion we are not claiming any outstanding advantages for intravenous sodium pentothal anesthesia even in selected vaginal deliveries and are neither using nor recommending it as a routine obstetrical anesthetic. However, in our hands it admirably solved an embarrassing anesthetic situation. As used in a small series and in 2 per cent solution we have found it safe for mother and child. Its margin of safety seems to be such that a careful obstetric resident can quickly master the technique of its administration and can give it with little risk to patients. As such, it appears to be ideally adaptable to emergency obstetrical use but perhaps not to the casual

anesthetist. We are continuing to employ it in this manner and are convinced that it has a definite and permanent place in obstetrical anesthesia.

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ANDROLOGIC ENDOCRINOLOGY

Correlation of Clinical Symptoms, Urinary Hormone Excretion and Testicular Cytology

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THE diagnosis and classification of testicular failure (13) requires consideration of the dual function of the testis from the standpoint of etiology, pathology, hormoneology, and clinical symptoms. Several groups of workers have correlated recently these features of patients with intrinsic testicular disease.

Heller, Nelson, and Roth (6) employed the term 'functional prepubertal castrates' to describe patients with agenesis, hypoplasia or preadolescent atrophy of the testes and with wolffian duct remnants (epididymis and vas deferens). The testes of these patients are completely lacking in both functional seminiferous and androgenic tissue. Accordingly there is azoospermia and failure of development of the sexual characteristics (change of voice, appearance of body and genital hair and growth and maturation of the genitalia). The urinary excretion of 17 ketosteroids and estrogens is low or low normal and the urinary excretion of gonadotropins is characteristically increased due to compensatory pituitary hyperactivity. Although delayed epiphyseal closure may result in eunuchoid proportions these patients are of normal or short stature.

Klinefelter and associates have described another group of patients with partial testicular hypoplasia or atrophy. The subsequent studies of Heller and Nelson (5) have defined the clinical, pathologic, and hormonal characteristics of the entire syndrome. There is total destruction of the seminiferous apparatus with partial or no damage of the androgenic elements. Azoospermia is invariably present. Androgenic function may be normal

or severely deficient. The urinary excretion of 17 ketosteroids and estrogens ranges from normal to very low levels and that of the gonadotropins always shows compensatory elevation. A significant number of these patients has gynecomastia. The habitus ranges from eunuchoid to normal. This group of workers has presented a concordance of clinical symptomatology, testicular histology, hormone excretion and present concepts of hormonal interrelations of the testis.

The 8 patients reported by us illustrate some of the remaining discrepancies in current concepts of testicular function and pathology.

METHOD OF SELECTION AND STUDY OF PATIENTS

The workup of each patient included a complete history and physical examination, routine blood and urine studies, determination of the basal metabolism, roentgenograms of the sella turcica and of long bones for osseous age determination, special blood chemistry as indicated, testicular biopsy, and urinary hormonal studies. The testicular tissue obtained at biopsy was fixed immediately in Bouin's fluid, embedded in paraffin, sectioned and stained with hematoxylin-eosin and with Masson and Mallory stains. Reticulum stains were done when indicated. Urinary hormonal studies were based on a minimum of 4 to 6 consecutive 24 hour specimens. There were isolated 17 ketosteroids by extraction with carbon tetrachloride (7) and by purification with Girard reagent. Values were determined photoelectrically by the color reaction with m-dinitrobenzene (8, 16). The results are expressed as milligrams per 24 hours. In patient 8 the Osting method for 17 ketosteroids was used. Gonadotropins were determined by a modification of the method of Heller and

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Chandler (4) devised by Salmon in our laboratory. The method involves dialysis and alcohol precipitation of refrigerated 24 hour specimens, dehydration extraction and bioassay employing immature female rats. The results are expressed as rat uterine units, rat ovarian units and gross corpora lutea units per 24 hours.

PROTOCOLS OF PATIENTS

Patient 1 This 34 year old farmer entered the hospital because of bilateral inguinal hernias and varicose veins.

The clinical history revealed that he had been always nervous and subject to palpitations, and that he experienced muscular cramps in the arms and legs. He had passed a year previously a renal calculus. There was nocturia of three to four times and occasionally enuresis. Maturation had been rather slow the ages at which his voice changed and pubic hair appeared were not recalled but he shaved for the first time at the age of 20 years.

The physical characteristics are shown in Figure 12. The blood pressure was 10/76 millimeters of mercury. The skin had a dry inelastic, almost senile appearance. There was a pectoral hair, the axillary and pubic hair was normal in amount and in distribution, the facial hair was confined to the upper lip and to the chin and it was very sparse. In the left lobe of the thyroid, there was a 3 centimeter firm nodule which subsequently was shown to be a fetal adenoma. There were bilateral inguinal hernias and varicosities of the legs. The penis measured 3.6 inches in length and 3.5 inches in circumference at the corona. The scrotum was somewhat underdeveloped. The testes measured 1.5 by 0.75 inches and were fairly soft. The prostate was of normal size and consistency. The height was 74 inches, the span 78.5 inches, and the ratio of the upper half to the lower half of the body was 35 to 50. The weight was 127 pounds.

Routine laboratory studies revealed normal blood and urine. The basal metabolic rate was -25 per cent. Roentgenograms of the chest and sella turcica were normal.

Examination of the seminal specimen which was cubic centimeter in volume showed no spermatozoa.

Urinary hormone data included a 17 β testosterone excretion of 6.6 milligrams per 24 hours (normal 11 to 20 mgm. per 24 hours) and a gonadotropin excretion of 25 rat uterine units, 12 rat ovarian units, 4 rat corpora lutea units per 24 hours (normal values 6 to 10, 3 to 7, 0 to 2 units per 24 hours, respectively).

Histological studies of the biopsied testes showed that the normal architecture was grossly distorted by the loss of many seminiferous tubules as well as by a great hyperplasia of the Leydig cells (Fig. 3a). Some of the better preserved tubules showed a single layer of spermatogenic cells enclosed by a dense, hazy hyalinized basement membrane which had a

fibrillar structure or resembled closely Askanazy's degeneration seen in tuberculous meningitis (Fig. 3b). Twisted columns of dense hyaline material represented the end stages of tubular deterioration. In some areas there was an increase in the number of blood vessels and some of the arteries appeared unusually thick walled. The remainder of the tissue showed a diffuse or nodular hyperplasia of the Leydig cells. In some areas the Leydig cells are greatly hypertrophied. Often they were arranged in cords or sheets and in these areas there was a uniformity of appearance. The cell size was relatively normal and the cytoplasm thready and deep-staining with a peripheral pale or almost foamy zone (Fig. 3b). The cell boundaries appeared very indistinct. In other areas small groups of cells were supported by a delicate fibrillar stroma; these cells usually showed a foamy cytoplasm. In still other areas groups of very small Leydig cells with proportionately small but vesicular nuclei were found; the cytoplasm of these cells stained very densely. There were occasional regions in which the size of the cells showed remarkable variation even in a small field. Some of the nuclei were gigantic and rather irregular in outline with a dense granular chromatin network. The nucleoli were very prominent. Golden pigment was found in the cytoplasm of some cells but no crystalloids were present.

In summary the clinical evidence of hypogonadism was manifested by the eunuchoid build, the scanty body hair and very sparse beard, the senile skin and the small testes. The nervousness, muscular cramps and urinary frequency possibly may have been symptoms of androgenic failure. Azoospermia was present. The hormonal studies showed a 17 ketosteroid output of less than half the normal value whereas the urinary excretion of gonadotropin was approximately twice the maximum normal level. Despite these findings (highly suggestive of Leydig cell failure) the testes showed massive Leydig cell hyperplasia; moreover large numbers of these cells appeared entirely normal when studied by available histological methods.

Patient 2 This 18 year old millworker entered the hospital because of a slipped femoral epiphysis.

The clinical history revealed that he was the tallest member of his family and that he had always been thin. His voice changed at 14 years of age and pubic hair appeared at 17 years. No axillary hair had appeared and he had not shaved. He claimed normal heterosexual interests but had not had sexual intercourse. His height was 58 inches at 5 years of age and 70 inches at 18 years; he subsequently grew 4 inches in the following year and one-half

The physical characteristics are shown in Figure 1b. The blood pressure was 105/75 millimeters of mercury. There was poor muscular development and the joints were loose and hyperextensible. A slipped femoral epiphysis was demonstrated. There was no facial or axillary hair and the pubic hair was very scanty. The penis measured 6 inches in length and 5 inches in circumference at the corona. The scrotum was well developed. The testes measured approximately 1.0 by 0.75 by 0.75 inches. The prostate was normal in size and in consistency. The height was 74 inches, the span was 74 inches, and the ratio of the upper half to the lower half of the body was 32 to 42. The weight was 114.5 pounds.

Routine laboratory studies revealed normal blood and urine. The serum cholesterol was 173 milligrams per cent. The basal metabolic rate was -4 per cent. Visual fields were normal. A roentgenogram of the chest was normal. Roentgenograms of the skull showed a bridged sella turcica, absence of the frontal sinus and very few mastoid air cells. The osseous age was +10 to -14 years at the chronological age of 18 and was +14 to -16 years at the age of 19.5.

Examination of the seminal specimen, 0.5 cubic centimeter in volume, showed no spermatozoa.

The urinary hormone data included a 17 ketosteroid excretion of 11.3 milligrams per 24 hours and a gonadotropin excretion of 25 rat uterine units, 20 rat ovarian units, and less than 10 corpora lutea units per 24 hours.

Histological studies of the biopsied testes showed that the general architecture of the tissue was well preserved (Fig. 1c). The tubules were of normal size. The basement membrane was normal in the majority but in a few tubules it showed slight thickening and hyalinization. Within the tubules there was only a single layer of cells among which Sertoli cells were conspicuous (Fig. 1d). No unequivocal spermatogenesis or spermatid stages were found. In some areas and usually near the periphery of the biopsy specimen the tubules were slightly distended by basophilic concretions which were granular or concentrically ringed, and contained occasional minute particles of highly refractile material. These masses compressed the tubular lining to a single layer of flat cells with dark, almost pyknotic nuclei and in advanced stages of the lesion caused disintegration of the tubular wall. The stroma was of delicate, fibrillar character. The Leydig cells were ample in number and were scattered diffusely throughout the stroma in groups of 3 to 10 cells. The majority was of normal size but occasionally hypertrophied cells collected in groups which attained the size of a tubule. A fair proportion of the Leydig cells had a milky or foamy cytoplasm but there were many cells which had an almost homogeneous, indistinct weakly acidophilic cytoplasm (Fig. 1d). The nuclei were of normal size oval in contour and showed the usual diffuse chromatin network. The nucleoli often were unusually prominent. No pigment or crystalloids were seen and no vascular changes were observed.

In summary, the clinical evidence of hypogonadism of this patient consisted of eunuchoid build retarded development of scanty pubic hair absence of beard or body hair poor muscular development, small testes (with a large penis) and delayed ossification of the long bones. Azoospermia was present. The 17 ketosteroid value of 11.3 milligrams per 24 hours just fell within the lower limits of normal and the gonadotropin output was twice the maximum normal level (practically identical with patient 1). Despite this 17 ketosteroid level which was almost double that of patient 1 there were actually far fewer Leydig cells present and these occurred in small groups and strands rather than in the hyperplastic masses seen in the first patient.

Patient 3. This 17 year old student entered the hospital for the investigation of small testicles.

The clinical history revealed that pubic hair appeared at approximately 12 to 13 years of age. He shaved at the age of 17 years and he has shaved once or twice per week since that time. His physical strength always had been poor. The sexual outlook and activity were said to be normal.

The physical examination showed a definitely feminine habitus and the patient appeared somewhat younger than his age. The voice was adolescent in character and it continued so for several years. The beard and body hair were very sparse, there was moderate axillary hair and scanty pubic hair of feminine distribution. The nipples were prominent and erectile. The hips were wide. The penis was about three fourths of normal size. The scrotum was well formed and the testes were one half normal size and were soft in consistency. The prostate was approximately one half inch in diameter. The height was 69.5 inches, the span was 71.5 inches, and the ratio of the upper half to the lower half of the body was 35 to 34.5. The weight was 135 pounds.

Routine laboratory studies revealed normal blood and urine. Basal metabolic rate ranged from -12 to -23 per cent. The visual fields were normal. Roentgenogram of the sella turcica was normal. The epiphyses of the long bones were closed.

Examination of the seminal specimen, which consisted of a few drops of fluid, showed no spermatozoa present.

The urinary hormone data included a 17 ketosteroid excretion of 18.4 milligrams per 24 hours and a gonadotropin excretion of 60 rat uterine units, 35 rat ovarian units and 7 rat corpora lutea units per 24 hours.

Histological studies of the biopsy tissue from the testes showed that the normal testicular architecture was entirely lost. The tissue consisted of irregular areas of condensed stroma in which the remnants

of seminiferous tubules remained visible as thickened hyalinized basement membranes surrounding lumens filled with debris or occasionally with a few Sertoli cells. Some small homogeneous areas indicated the site of completely degenerated tubules. The stroma contained many engorged vessels of all sizes which were in close proximity, indicating coagulation. There was massive nodular as well as medullary hyperplasia of the Leydig cells (Fig. 3a). In some areas these cells were distributed diffusely in large numbers among the other stromal elements elsewhere discrete nodules surrounded by concentrically flattened and compressed cells were present. The largest of these nodules measured 0.8 millimeter in diameter and was visible easily with the naked eye. The Leydig cells which were scattered diffusely throughout the tissue were generally of normal size with pale foamy cytoplasm and round or oval vesicular nuclei. No lipofuscin or crystalloids were seen (Fig. 3b). On the other hand, the cells within the hyperplastic nodules had a far different appearance. There was no longer a uniformity of cell size for many of the Leydig cells were very large and some of their nuclei were almost double normal size. An occasional foamy or almost clear cell could be seen, but the vast majority showed an intense eosinophilia, sometimes with a narrow clear zone at the extreme periphery of the cytoplasm (Fig. 3c). With the Masson stain the cytoplasm of these cells varied in color from steel gray to rose violet. Within these hyperplastic nodules numerous blood filled capillaries were present, but no other vascular changes were noted.

In summary the clinical evidence of hypogonadism of this patient consisted of scanty facial and body hair, an adolescent voice, poor physical strength, a small penis, testes and prostate. The habitus was definitely feminine. Azoospermia was present. Hormone studies showed a 17 ketosteroid output of 18.4 milligrams per day (a value near the upper limits of normal). Despite this value, the gonadotropin output was 60 rat uterine units per day (approximately 6 to 10 times normal excretion and representing the largest value in this entire group of patients). The Leydig cells showed massive, diffuse and nodular hyperplasia. Although a very large proportion of the cells (far more than in patient 1) showed abnormal cytology the 17 ketosteroid output was near the upper limits of normal. Finally despite this 17 ketosteroid output and histological evidence of Leydig cell hypertrophy and hyperplasia, clinical signs of androgen deficiency were unmistakable.

Patient 4. This 18 year old college student entered the hospital for the treatment of bilateral gynecomastia.

The clinical history revealed that he had noted the development of a subareolar lump in one breast and 6 months later a similar change occurred in the other breast. The hard nodules had regressed slightly with time. Pubic hair appeared at the age of 16 years. He shaved at 17 years and he has shaved once or twice a week since that time. His sexual drive was not very marked.

Physical examination showed a tall slender gracile build of somewhat feminine type. There was bilateral gynecomastia with an increase in both glandular and adipose tissue. There was minimal axillary and facial hair and there was almost no body hair. The pubic hair was scanty and of feminine distribution. The penis measured 3.5 inches in length and 3 inches in circumference at the corona. The scrotum was well developed. The testes measured 1.5 by 0.75 by 0.75 inches and were moderately firm. The prostate was small. The height was 70.5 inches, the span was 78.5 inches and the ratio of the upper half to the lower half of the body was 34.5 to 36.0. The weight was 160 pounds.

Routine laboratory studies revealed normal blood and urine. The basal metabolic rate was -7 per cent. The sella turcica and sinuses were normal on roentgenologic examination. The osseous age was 15 years.

Examination of the seminal specimen, which was 3 cubic centimeters in volume, showed 10,000,000 spermatozoa per cubic centimeter. Fifty per cent showed normal motility and 72 per cent showed normal morphology.

The urinary hormone data included a 17 ketosteroid excretion of 11.0 milligrams per 24 hours and a gonadotropin excretion of 5 rat uterine units, 3 rat ovarian unit and less than 3 corpora lutea units per 24 hours.

Histological studies of the biopsy specimen from the testes showed that architecture was fairly well preserved (Fig. 3d) although there was a great deal of interstitial hemorrhage and serous exudate. There was no condensation of the stroma and no peritubular fibrosis. A few completely hyalinized tubules and some areas of incipient hyalinization were seen, but for the most part the basement membranes were thin and delicate. The Sertoli cells were very prominent due to the scantiness of the spermatogenic cells. All stages of spermatozoal maturation could be seen in some of the other tubules. The Leydig cells occurred in groups which were usually of normal, but sometimes of increased size; there was no evidence of condensation in these hyperplastic areas (Fig. 3d). Elongated small transitional cells with homogeneous cytoplasm were fairly numerous. Most of the true Leydig cells had a vacuolated or foamy cytoplasm; they did not show the densely staining, hairy cytoplasm of cells described in patients 1 and 2. No pigment or crystalloids were found within the cells. The nuclei were fairly dense and the nucleoli seldom visible. No vascular changes were observed.

In summary this patient presented a eunuchoid habitus, feminine contour and be-

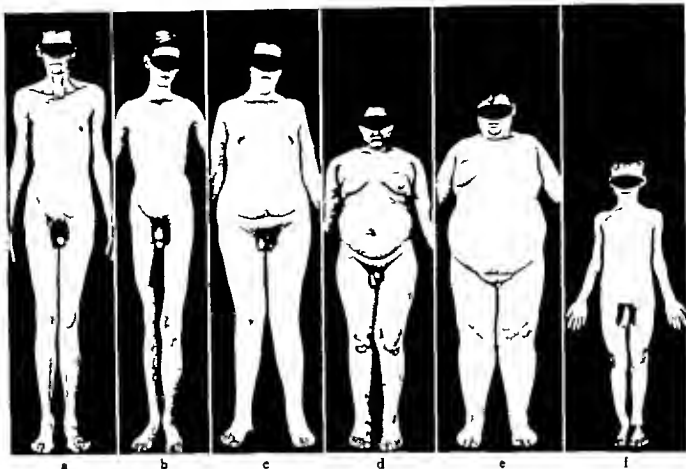


Fig 1 a Patient 1 b, patient 2 c, patient 5 d, patient 6 e, patient 7 f patient 8.

lateral gynecomastia. Pubic hair appeared late he shaved infrequently and the body hair was very scanty. The penis was of normal size but the testes and prostate were small. Normal spermatozoa were present in the seminal fluid. The 17 ketosteroid excretion (11 mgm per day) was at the lower limit of normal gonadotropin excretion was normal. The testicular biopsy showed a slight increase in the number of Leydig cells and definite regression of the spermatogenic elements even in the absence of elevated gonadotropins.

Patient 5 This 16½ year old schoolboy entered the hospital because of a slipped femoral epiphysis.

The clinical history showed that he "always" had been overweight and tall for his age. Pubic hair appeared at 13 years. The voice had not changed. Heterosexual interests had not developed.

The physical characteristics are shown in Figure 1c. The blood pressure was 130/90 millimeters of mercury. There was no facial, axillary or body hair and the pubic hair was scanty and of feminine distribution. The penis measured 2½ inches in length and 3 inches in circumference at the corona. The testes

were 0.5 by 1 by 1 inches and 0.75 by 1 by 1 inches in size. The prostate was small. The height was 70 inches, the span was 74 inches, and the ratio of the upper half to the lower half of the body was 34 to 36. The weight was 232 pounds.

Routine laboratory studies revealed normal blood and urine. The basal metabolic rate was -8 to -11 per cent. The blood sugar was 97 milligrams per cent. the serum cholesterol was 165 milligrams per cent. The sella turcica appeared normal. The osseous age was ± 15 years.

Examination of seminal specimens, which had volumes of 0.5 cubic centimeter, showed total spermatozoal counts of 65,000,000. Ninety five per cent of the spermatozoa had normal cytology. 50 per cent showed motility and normal motility was present in 20 per cent.

The urinary hormone data included a 17 ketosteroid excretion of 10.2 milligrams per 24 hours and gonadotropin excretion of less than 2 rat uterine ovarian or corpora lutea units per 25 hours.

Histological studies of the biopsy tissue from the testes showed that the architecture of the tissue was well preserved. The tubules were normal in size and in many of them all stages of spermatogenesis appeared. Many of the tubules showed a hyalinized basement membrane and in some areas there was an increase in peritubular hyaline connective tissue.



Fig Photomicrographs of testicular tissue and b, Patient and d, patient a.

Elsewhere the stroma had a delicately fibrillar character. The universal scarcity of Leydig cells was very remarkable. They appeared on or two cell at a time in the areas of loose interstitial tissue; none of the usual small aggregates of cells was seen. The Leydig cells themselves were uniformly small. The cytoplasm was often foamy but sometimes stained a homogeneous pink with eosin. No pigment or crystalloids were present. The nuclei varied from homogeneously dense to vesicular in appearance. No vascular changes were noted.

In summary this obese patient presented a feminine eunuchoid habitus, scanty pubic hair, an adolescent voice, small penis, testes and prostate, and decreased seminal volume, motility and total count, although the spermatozoal count per cubic centimeter was normal. Both 17 ketosteroid (10.2 mgm. per day) and gonadotropin excretion (less than 2 rat uterine units per day) were definitely

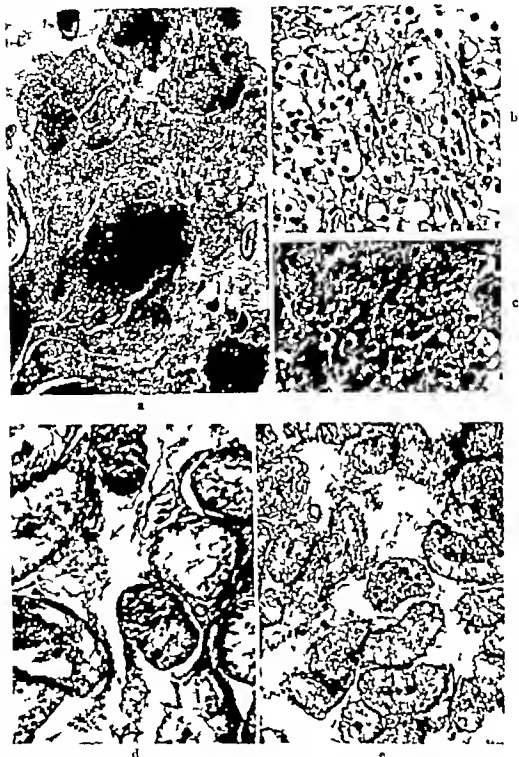


Fig. 3. Photomicrographs of testicular tissue. a, b, and c, Patient 3 d, patient 4 e, patient 7

low yet relatively few small Leydig cells (even with a low gonadotropic stimulation) secreted more 17 ketosteroids than the hyperplastic overstimulated cells of patient 1

Patient 6 This 14 year old negro boy consulted the Endocrine Clinic because of a 40 pound weight gain in 6 months.

The clinical history showed that he always had been somewhat overweight, and that he had a voracious appetite and a marked craving for sweets. Asthma had been present since the age of 7 years. Pubic hair appeared at 13 years. No erections or nocturnal emissions had been noted. Psychiatric examination was normal.

The physical characteristics are shown in Figure 1d. The blood pressure was 150/90 millimeters of

mercury. The axillary hair was scanty the pubic hair abundant. There was no facial or body hair. A nodule of glandular tissue about 1.5 inches in diameter was present in the ample fat tissue of each breast. The penis measured 3.5 inches in length and 3.5 inches in circumference at the corona. The scrotum was well developed. The testes measured 1.75 by 1.25 by 1 inches and 2.0 by 1.25 by 1 inches and were of normal consistency. The height was 66.5 inches. The span was 79 inches. The ratio of the upper half to the lower half of the body was 35 to 35.5. The weight was 183 pounds.

Routine laboratory studies revealed normal blood and urine. The basal metabolic rate was +6 and +15 per cent. The visual fields were normal. Skull roentgenograms showed slight bridging of the sella turcica, normal frontal and rudimentary mastoid sinuses. The osseous age was normal.

An epididymal puncture showed an absence of spermatozoa.

The urinary hormone data indicated a 17 ketosteroid excretion of 7.3 milligrams per 24 hours and a gonadotropin excretion of less than 3 rat uterine ovarian, or corpora lutea units per 24 hours.

Histological studies of the biopsied testes (Fig. 4a) showed that the architecture of the testis was well preserved. The tubules were of normal size the basement membranes were delicate and of normal thickness save for occasional hyaline areas. Sertoli cells were present in normal numbers but there was a marked decrease in the spermatogenic elements. Small numbers of spermatogonia, occasional spermatocytes and in a few tubules spermatids were noted. The stroma showed a patchy increase in the form of widened bands of intertubular tissue. The stroma, even in these areas, was delicate and fibrillar in character with the elongated nuclei of fibrocytes being the chief cellular elements. Vesicular nuclei were seen infrequently the cytoplasm was pale and homogeneous. No pigment or crystalloids were seen and no vascular changes were observed.

In summary this obese, eunuchoid negro boy with bilateral gynecomastia developed pubic hair at the usual age. The osseous age, the penis, testes and scrotum were normal. Azospermia was present. The 17 ketosteroid excretion was normal for the age and the gonadotropin excretion was low. The testes showed decreased spermatogenesis and infrequent, small Leydig cells. This, then is the first patient to run true to expectation low gonadotropins low normal 17 ketosteroid excretion relatively few Leydig cells (but normal-sized testes) and minimal signs of hypogonadism. The eunuchoid habitus may have been a racial characteristic.

Patient 7. This 16 year old boy entered the hospital because of obesity and feminine appearance.

The clinical history indicated that the patient had been obese since childhood weighing 178 pounds at 10 years of age and 287 pounds at 13 years. The voice was high pitched at the age of 16. No body or facial hair had appeared, and no erections or nocturnal emissions had been noted. Increased craving for sweets, polydipsia and oliguria were present.

The physical characteristics are shown in Figure 1c. The blood pressure was 130/90 millimeters of mercury. Genu valgum and an increased carrying angle at the elbow were noted. There was slight hair on the chin and pubis. In addition to abundant adipose tissue there was a mass of firm glandular tissue about 2 inches in diameter in each breast. The penis measured 3 inches in length and 3.5 inches in circumference at the corona. The scrotum was small. The testes measured 1.5 by 0.75 by 0.5 inch. The height was 66.5 inches. The span was 67.9 inches. The ratio of the upper half to the lower half of the body was 34 to 35.5. The weight was 300.5 pounds.

Routine laboratory studies revealed normal blood and urine. The basal metabolic rate was +33 per cent. The electroencephalogram was normal and the intelligence quotient was 84. Visual fields showed questionable concentric narrowing. Roentgenogram of the sella turcica was normal. The osseous age was +10 to -15 years.

A seminal specimen could not be secured.

The urinary hormone data indicated a 17 ketosteroid excretion of 4.7 milligrams per 24 hours and a gonadotropin excretion of less than 3 rat uterine, ovarian, or corpora lutea units per 24 hours.

The histological studies of the biopsied testes showed that the architecture was somewhat normal. The tubules were uniformly small in size and the connective tissue was prominent and rather condensed, as if all the structures had decreased in size (Fig. 3c). There was some increase in the peritubular connective tissue and the basement membranes of the tubules had a highly refractile appearance, resembling somewhat the elastica interna of an artery (Fig. 4c). The seminiferous apparatus consisted chiefly of Sertoli cells although spermatogonia and occasional spermatocytes were present. Most of the tubules were solid cords of cells with masses of amorphous debris or cellular material in place of a lumen very rarely a tubule with a true lumen was seen. The stroma was increased throughout, and varied from a loose areolar network to fairly dense hyaline strands. The stromal cells were chiefly mature fibrocytes although some had vesicular nuclei. Fibroblasts were present in the areas of loose connective tissue. There were no cells which could be identified as Leydig cells. The largest vesicular nuclei were not associated with cells having definite boundaries or distinct cytoplasm. No vascular lesions were observed.

In summary this very obese boy of somewhat feminine habitus showed a delay in the development of genital hair a high pitched voice, gynecomastia, retarded ossification, &

sequent cultures were positive. Responses of this type are classified as failures.

2 Results In summarizing the overall results of therapy in the group of 465 cases, clinical and bacteriological cures were obtained in 34 per cent of the patients. In an additional 21 per cent, clinical improvement resulted, but the urines did not become sterile. Outright clinical failures occurred in 45 per cent of the 465 cases.

ANALYSIS OF RESULTS OF THERAPY

The failure to obtain any beneficial results in 45 per cent of the patients treated stimulated an inquiry into the causes of failure, to determine if the cure rate could be improved in patients treated in the future. The effects of streptomycin therapy were catalogued on the following points: (1) bacterial flora, (2) monobacterial versus polybacterial infections, (3) obstruction of urinary flow and presence of unsterilizable foci, (4) bladder paresis, as in paraplegia, (5) clinical diagnosis, (6) dosage, (7) duration of therapy and (8) presence of resistant organisms. The analysis will now be presented in this order.

1 Bacterial flora. The bacterial flora of the urinary tract infections comprising this series is shown in Table I. Eight hundred twenty-eight organisms representing 9 different species and a group of unidentified gram-negative bacilli are listed. Seventy-nine per cent of the total number are gram-negative bacilli. The remaining 21 per cent are gram-positive cocci, one third of which are the penicillin-resistant and sulfonamide-indifferent nonhemolytic streptococci. It is reiterated that a substantial majority of these bacteria are inhibited by concentrations of streptomycin which are easily maintained in the blood and urine by parenteral administration of the drug. Excluded of course are those bacteria which have acquired irreversible drug fastness, a constant feature of unsuccessful streptomycin therapy.

2 Monobacterial versus polybacterial infections. One hundred eighty-six patients (40%) had monobacterial infections, while in the remaining 279 (60%) the infection was polybacterial.

The outcome of streptomycin therapy in the 186 monobacterial infections is summa-

rized in Table II, according to causal organisms. The most gratifying results were obtained in infections due to *Escherichia coli*, *paracolon* bacilli, and *Aerobacter aerogenes*. Fewer cures followed the use of streptomycin in infections due to other organisms. The results in infections caused by *Klebsiella pneumoniae*, *Pseudomonas aeruginosa*, and *Staphylococcus aureus* are disappointing.

A comparison of the therapeutic effects obtained in monobacterial and polybacterial infections shows no appreciable difference between the 2 groups in the clinical results obtained. The greatest difference appears in the bacteriological results. Here it is noted that positive cultures persisted 16 per cent more frequently in the polybacterial than in the monobacterial group. This difference is statistically significant (1).

3 Obstruction of urinary flow and presence of unsterilizable foci. In an analysis of the results of therapy in patients with and without urinary calculi the contrast in the favorable results obtained in the noncalculus group with the unfavorable results obtained in infections complicated by calculi makes it clear that failures are an almost constant feature in the latter type of case. Needless to say, these figures are statistically significant (1). Accordingly streptomycin therapy should be withheld in the management of patients with symptomatic obstructive calculi until such time as the drug can be employed as part of the regimen aimed at removing the obstruction. Excepted of course are patients with actual bloodstream invasion when the drug may be required as a life-saving measure.

4 Bladder paresis. All paraplegias have some degree of nervous dysfunction of the bladder which is ordinarily designated as "cord bladder." The usual features are a weak detrusor action and an incompetent sphincter. These patients have urinary stasis as well as urethrovaginal and vesicoureteral reflux.

Forty-two per cent of the patients in this series were paraplegics. In a comparison of the results obtained from streptomycin therapy in paraplegic patients and in nonparaplegic patients, no striking difference in the clinical cure rate was observed. However a

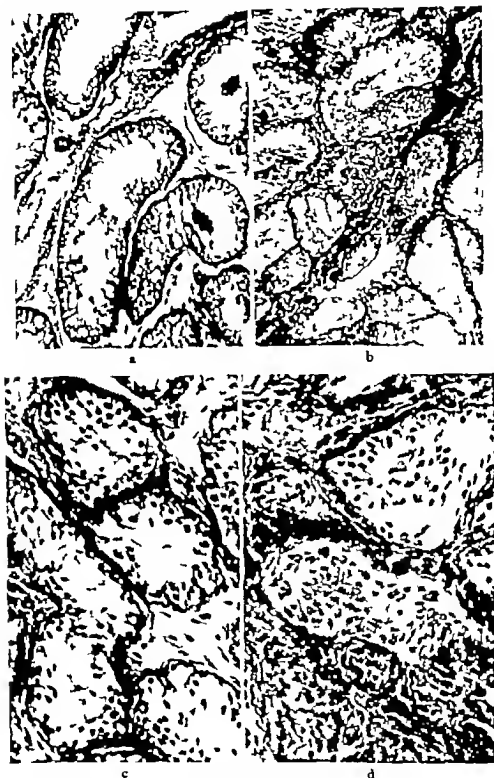


Fig. 4. Photomicrographs of testicular tissue. a and c, Patient 6 b and d patient 8.

penis of normal size, small testes and azoospermia. The 17 ketosteroid excretion was very low (4.7 mgm per day) and the gonadotropin excretion was also low. Extremely few Leydig cells were present. This patient also runs true to expectation (i.e. atrophy of

the Leydig cells, low gonadotropins and low 17 ketosteroids, probably entirely of adrenal origin). Under these circumstances the presence of bilateral gynecomastia is rather remarkable and it does not seem very likely that the hypofunctional testes should be held re-

sponsible. The presence of a normal sized penis and of clinical evidences of hypoandrogenism is worthy of note (see patient 2)

Patient 8 This 6 5 year old boy entered the hospital because of precocious statural and sexual development which was noted approximately 1 5 years previously

The clinical history showed that he always had been a "precocious" child however enlargement of the penis was not observed until the age of 5 years. Pubic and axillary hair and acne appeared at the age of 6 years. No voice changes were noted and there was no unusual sexual activity. During the observation his growth was as follows: At 6 5 years, the height was 52 inches the span was 51 inches and the ratio of the upper to the lower half of the body was 17 to 25. The weight was 50 pounds. At 7 years, the height was 54 inches the weight was 65 pounds. At 8 years the height was 57 25 inches the span was 57 inches and the ratio of the upper to the lower half of the body was 20 to 25. The weight was 78 pounds. His voice changed at 8 years.

The physical characteristics are shown in Figure 1f. There was no facial hair but acne was present over the forehead chin and nuchal regions. There was moderate axillary and pubic hair. The penis measured 4 5 inches in length and 3 5 inches in circumference at the corona. The scrotum was small. The testes measured 0 by 0 5 by 0 5 inch. The prostate was compatible with the penile size.

Routine laboratory studies revealed normal blood and urine Ca^{++} for a red blood cell count of 5 6 million. The basal metabolic rate was -4 per cent. The glucose tolerance curve was fasting, 50 milligrams per cent 0 5 hour 05 milligrams per cent 1 hour 127 milligrams per cent 2 hours 115 milligrams per cent 3 hours 115 milligrams per cent 4 hours 1 milligrams per cent. The blood chlorides were 502 milligrams per cent. The serum sodium was 14 milliequivalents per liter and the serum potassium was 4 0 milliequivalents per liter. The thyroid fields were normal. Intra venous urograms were normal. A roentgenogram of the sella turcica appeared normal. The frontal sinuses were absent at 6 5 years and present at 8 years. The osseous age was 4 to 5.

An epididymal puncture yielded no spermatozoa.

The urinary hormone data indicated a 17 ketosteroid excretion of 7 3 milligrams per 24 hours (normal values 2 to 4 milligrams per 24 hours) and gonadotropin excretion of 20 rat uterine units per 24 hours.

Histological studies of the biopsied testes showed that the architecture of the tissue generally was well preserved (Fig 4b). Many tubules were immature but their appearance size and number were compatible with the patient's age. The basement membrane was highly refractile and there was slight hyalinization of some of the tubules. The Sertoli cells were numerous and spermatogonia were present in moderate numbers occasional cells resembling

spermatocytes were seen but spermatogenesis did not progress beyond this stage. In a very few tubules degenerative changes of a localized character were present but not in unusual numbers. Many of the tubules showed no lumen. The stroma was very scanty in some areas it consisted of a surprisingly dense hyaline connective tissue and in others of delicate scattered fibrocytes and fibroblasts. Occasionally larger round nuclei, suggestive of Leydig cells, were present but no fully developed Leydig cells were found (Fig 4d). There were no aggregates of round nuclei indicative of potential Leydig cell development. No vascular lesions were noted.

In summary the bright weight, ossification pubic, leg and axillary hair and penile and prostatic size were greatly advanced. Acne was present. There was, however no change in the voice, no facial hair no evidence of sexual activity and no seminal fluid. The 17 ketosteroid output (7 3 mgm. per day) was approximately double the normal value and the gonadotropin excretion was markedly elevated. The histological appearance of the seminiferous tubules and of the Leydig cells was consistent with the patient's age, apparently showing no response to the increased gonadotropin secretion. Androgen production of this patient was apparently extratesticular.

The clinical hormonal and cytologic findings of these 8 patients are summarized in Table I.

DISCUSSION

Clinical criteria of androgenic deficiency (3). The development of body hair is one of the most prominent clinical features of androgenic activity. Although racial and constitutional factors, as well as the activity of the adrenal cortex, play important roles in determining the amount and distribution of body hair the time of appearance of body hair yields important evidence of the state of testicular androgen production. In this respect, the hair of the face affords a very sensitive index of androgenic activity both the amount and distribution but particularly the time of appearance and rate of growth (easily measured by the frequency of shaving) are important. The characteristics of the facial hair obviously are subject to considerable individual variations.

The pitch of the voice and the age at which the voice changes are also valuable evidence of an-

TABLE I—SUMMARY OF CLINICAL, HORMONAL, AND CYTOLOGIC DATA

	Patient 1 Intrinsic hypogonad- ism (Heller-Nel- son type)	Patient 2 Intrinsic hypogonad- ism (Heller-Nel- son type)	Patient 3 Intrinsic hypogonad- ism (Heller-Nel- son type)	Patient 4 Hypogonad- ism unclassified	Patient 5 Hypo- pituitary hypogonad- ism	Patient 6 Hypo- pituitary hypogonad- ism	Patient 7 Hypo- pituitary hypogonad- ism	Patient 8 Intrinsic hypogonad- ism and hy- popituitary adrenogen- italism
Deviation in pounds from nor- mal weight		- 5	0	+20	+	+7.5	+ 80	+20
Eunuchoid habitus	+	+	?	+	+	+	?	
Fertilization			+	+	+	+	+	+
Size of penis	Normal	++	-	Normal	-	Normal	-	++
Decreased testis size	+++	++	++	+++	+++		+++	
Gynecomastia				+		+	+	
Osseous age		-	Normal	-	Normal	Normal	-	+
Number of Leydig cells	++	+	+++	+	-	---	---	-
7 ketosteroids mgm per hour	6.6	3	18			7.3	1.7	7.3
Gonadotropine rat uterine mass per 24 hours	5		60	5	Less than 5	Less than 5	Less than 5	20

drogenic activity although apparently not quite as sensitive signs as beard growth

The *body habitus* is the result of complex hormonal phenomena acting over prolonged periods of time. The persistence of juvenile fat distribution is only one feature of androgenic deficiency. Retardation of epiphyseal closure and compensatory pituitary hyperactivity due to the intrinsic testicular failure appear to be the basis for the development of a eunuchoid habitus. Heller and Nelson (6) have shown however and we have confirmed their findings, that this hormonologic pattern does not result necessarily in a eunuchoid habitus. In the objective determination of eunuchoid build we have found that, in the absence of skeletal deformity, the ratio of the upper to the lower half of the body reveals more often eunuchoid proportions than the ratio of height to span. The reason for this is quite obvious: measurement of the upper and lower halves of the body provides a direct comparison between the vertebral column (flat bones) and the long bones, whereas measurements of the height and the span include elements of each bone type (long bones, shoulder girdle and vertebral column) and therefore, these tend to dilute the anthropometric disproportion. Deformities, as genu valgum and kyphosis, however will render these measurements misleading unless the disproportion is very marked.

The *size of the penis* is often a very poor criterion of androgenic activity for rather severe degrees of deficiency may be present before diminutive size becomes significant. Furthermore, we have observed patients, with obvious evidence of hypogonadism who have normal or even large penes (patient 2). It is very interesting however that increase in penile size is one of the first responses to testosterone therapy.

The *size of the testes* bears only the crudest relationship to the clinical signs of testicular function. A small testis may show large numbers of highly active Leydig cells or a testis of normal size and consistency may show a great deficiency of hormone producing tissue.

The *size of the prostate* being unsuitable for exact measurement can be used only to judge gross deficiencies of androgen production.

Sexual interest activity and potency involve far too many psychological factors to be of clinical value in the majority of patients.

Muscular strength, endurance and stamina also are influenced greatly by psychological factors and should be evaluated with great caution. It is possible that objective measurements may yield worthwhile information especially in the evaluation of treatment of hypogonadism.

Other signs of androgen deficiency as the dry senile appearance of the skin, muscular cramps, urinary frequency and nocturia,

represent severe degrees of androgen deficiency.

Biochemical criteria of androgen deficiency
The usual urinary hormonal studies provide a poor estimate of testicular function. The 17 ketosteroid excretion may be determined with considerable accuracy although it involves a long and tedious chemical procedure. However the data represent the combined 17 ketosteroid output of testes and adrenals. In relating these data to androgen production one assumes that the androgenic steroids form a more or less constant proportion of the total 17 ketosteroid output. This assumption is likely to be fallacious especially when a disturbance of the steroid metabolism is suspected. On the other hand present methods of androgen assay do not permit general clinical usage. The technique of chromatographic analysis has been applied recently to clinical practice if these data were quantified and correlated with androgenic activity they would provide a great advance in both qualitative and quantitative studies of steroid excretion.

Criteria of testicular pathology
Most of the careful cytological studies of the Leydig cells have been made in animals, partly because of the availability of material and partly because human autopsy material is frequently unsuitable for studies of the normal state (14). In fact only within the last decade, has it been realized that the 'textbook appearance' of testicular tissue is the exception rather than the rule (17).

There is a number of formidable difficulties in the interpretation of testicular pathology. Measurement of the total volume of tubules or Leydig cells of normal testes has been unsatisfactory even with the use of planimetric methods; the difficulty of making these estimates in the presence of pathological alterations is much greater (15). Far more important is the fact that there are no specific histochemical techniques for the measurement of hormone production of Leydig cells. The usual cellular stains (hematoxylin-eosin and Masson) reveal nonspecific cytological changes which are extremely difficult of correlation with functional activity. General lipid stains (Sudan and Nile blue) do not reflect the 17

ketosteroid content of the cells and are generally of little value. Stains for cholesterol-like substances, based on the Liebermann-Burchardt reaction are more specific, but these are subject to the same criticism and they are often unreliable. The most valuable histochemical methods, apparently are based on the phenylhydrazine stain of Bennett (12). This method at first was thought to be specific for 17 ketosteroids, but some doubt recently has been expressed in this regard (1). It is unfortunate that this method as yet has not been applied to clinicopathological studies of testicular function.

The presence of the crystalloids of Renle apparently reflects to some degree the steroid-producing function of the Leydig cells. These odd-shaped bodies which stain with safranin, methyl violet, or other common dyes, give histochemical reactions of globulins, and not those of lipids. Their presence or absence, nevertheless, correlates fairly well with major changes in Leydig cell function.

It is agreed generally that the appearance of mitochondria and of the Golgi apparatus affords valuable evidence on the functional state of a cell. The material obtained by testicular biopsy is suitable for these studies (2) which would provide valuable information.

Descriptions of the histology of the testis (save for its spermatogenic elements) are scattered in the literature and are influenced often by histological studies of other species. Moreover the criteria of normalcy especially of the interstitial elements, are poorly defined. It is necessary to describe therefore, what are considered normal features of some testicular elements (2, 11).

The seminiferous tubules are bounded by a basement membrane which is strengthened by a layer of lamellated connective tissue. Both elastic and collagenous fibrils are present; the width of this band varies from about 1 to 4 microns. Within the tubule, spermatogenic and the Sertoli cells are found. The spermatogenic cells will not be discussed as detailed descriptions are found in any textbook of histology (11). The Sertoli cells, however are of considerable interest. The function of these cells is entirely unknown although they have been thought to be "supporting" or "nutri-

tive' elements supposition without any foundation of fact. Recently estrogen producing, Sertoli cell tumors of the testis have been described (9) which may be the first objective evidence of the function of these cells (18)

The seminiferous tubules are supported in a loose stroma composed of collagenous fibrils, blood vessels, nerves, fibroblasts, macrophages, mast cells, and Leydig cells. The Leydig cells are scattered singly or in small groups of 4 to 10 cells throughout the stroma without any relation to tubules or blood vessels. The accumulations of cells as shown by Klinefelter and associates should not be regarded as normal and, in fact, were regarded as hyperplasia by the pathologist to whom they were shown. There are also smaller cells which are hard to distinguish from fibroblasts but their proximity to nests of Leydig cells suggests their developmental potentialities. The Leydig cells themselves are round, irregular or polyhedral in shape, about 14 to 20 microns in size, with a nucleus 5 to 8 microns in diameter, round and usually eccentric. The nuclear chromatin occurs in fine strands or granules and 1 to 3 large nucleoli usually are present. There is an attraction sphere around the nucleus and the Golgi apparatus is found immediately outside this region. Occasional binucleated cells are normally present. The cytoplasm is highly granular and contains numerous lipid globules (especially near the periphery) giving the cell a foamy appearance. Many of these fat globules are filled by nonlipid material with a surface coating of fat. Neutral fats, phosphatids, glycolipids, cholesterol esters, and steroids have been identified in the cytoplasm. There are found also the crystalloids of Reinke which may be seen also in the Sertoli cells. Lipofuscin, a brownish wear-and-tear pigment, appears after adolescence and generally tends to increase with age. Occasionally smaller cells with dense chromophile cytoplasm suggesting transitional forms from fibroblast like cells are observed.

With this discussion of normal cytology and of the distribution of Leydig cells in mind, it becomes possible to evaluate the alterations observed in our patients as well as in those of others. There has been an unusual hesitancy to make the differential diagnosis between

hyperplasia and *condensation of the Leydig cells*, although suitable criteria for this differentiation have long been established by pathologists.

Condensation implies the loss of parenchyma; the stroma does not disappear in proportion and there remain residual structures as an increased number of blood vessels, which are closer together than usual. One expects to find also remnants of degenerated tubules which do not disappear entirely but leave dense, hyalinized discs at their previous sites. With the collapse of the stroma, groups of Leydig cells are brought into closer proximity. These aggregates should have an alveolar type of structure with islands of irregular size and shape which are separated by variable amounts of stroma. In lesser degrees of condensation where these changes are not so marked the irregular distribution of the reticulum fibrils is evident and is quite different from the regular and even distribution of hyperplasia. Moreover it is manifestly impossible to consider unusually large aggregates of Leydig cells as condensation phenomena when they are embedded in loose areolar tissue (Fig. 3d).

Hyperplasia may be of diffuse or nodular variety (Figs. 2a and 3a). The former type develops from an overgrowth of the normal pattern with gradual coalescence of the groups to form a medullary cell mass with a delicate reticulum and very scanty stroma. There is obviously no difficulty in distinguishing this from condensation phenomena. With stronger irregular proliferation nodular conformations may appear. These also are differentiated easily from condensations because the stroma within the nodule is delicate and homogeneous instead of irregular and strand like, and because the tissues of the periphery often will show signs of compression, as concentric flattening of the adjacent stroma and parenchyma. The coexistence of condensation and hyperplasia is seen (Fig. 3a) and there has been no difficulty in distinguishing the two. We have felt, therefore, that it is wise to abstain from nonspecific terms as 'clumping'. The differentiation of condensation and hyperplasia is of great functional significance and every effort should be made to distinguish the two.

SUMMARY

In these 8 patients we have observed some agreement and many discrepancies between the expected and the observed findings. These may be summarized as follows:

1 *Leydig cells and hormone excretion.* Increased numbers of Leydig cells were associated with low (patient 1) or high (patient 3) 17 ketosteroid excretion or with normal (patient 4) or high (patients 1-2-3) gonadotropin excretion. Decreased numbers of Leydig cells were associated with very low (patient 7) low normal (patient 5) or high (patient 8) 17 ketosteroid excretion and with low (patients 6-7) or high (patient 8) gonadotropin excretion. We confirm, therefore, the observation of Heller and Nelson (5) that there is no quantitative correlation between elevation of gonadotropic excretion and the 17 ketosteroid output.

2 *Clinical symptomatology.* Clinical evidence of hypoandrogenism was observed in the presence of low (patient 1) or high (patient 3) 17 ketosteroid excretion. Eunuchoid habitus was present with high (patients 1-2) normal (patient 4) or low (patient 5) gonadotropin excretion or with increased (patient 1) or decreased (patient 6) numbers of Leydig cells. A large penis was noted with low normal (patient 2) or high (patient 8) 17 ketosteroids and a small penis with high normal 17 ketosteroids (patient 3).

Evidence of feminization was observed with high normal 17 ketosteroids and increased numbers of Leydig cells (patient 3) with low normal 17 ketosteroids (patients 4, 5) and with low 17 ketosteroids and few Leydig cells (patient 7).

Gynecomastia was observed in the presence of increased (patient 4) or greatly decreased (patients 6-7) numbers of Leydig cells and yet with normal sized penis (patient 6). It was seen with normal (patient 4) or low (patients 6-7) gonadotropin excretion or with low normal (patient 4) or low (patient 7) 17 ketosteroid excretion.

CONCLUSIONS

These 8 selected patients illustrate notable discrepancies between clinical evidence of androgenic activity, urinary hormone excretion, and testicular histology.

Alterations of the Leydig cells, as hypertrophy or hyperplasia *per se*, cannot be regarded as indicative of increased or even of normal secretory activity. It is possible that studies of mitochondria and Golgi apparatus, as well as the use of perfected histochemical techniques may provide in the future adequate cytologic criteria of endocrine cellular activity.

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A COMPARATIVE STUDY OF THROMBOANGIITIS OBLITERANS IN WHITE AND NEGRO PATIENTS

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SINCE the appearance of the original studies of Buerger in 1907 concerning thromboangitis obliterans much has been written concerning this disease. It was believed at first to occur almost exclusively in Russian Jews, but it has since been seen in patients of varied racial origin.

The impression is widespread that this disease is rare in the negro and this would appear to be confirmed by the small number of cases of this disease in the negro which have been recorded in the literature. Our interest in this subject was aroused when we encountered an instance of thromboangitis obliterans in a negro woman. Because this is the first time that this disease has been observed in a female negro we shall describe later in this paper the salient clinical features presented by this patient. In addition to this however the purpose of the present paper is to present a comparative study of thromboangitis obliterans in white and in negro patients in a large general hospital in which the numbers of admissions of white and negro patients are approximately equal.

REVIEW OF THE LITERATURE

Gemmill (1925) was the first to report thromboangitis obliterans in the negro race. His patient was a male. Since no pathologic studies were presented the diagnosis must be considered as presumptive rather than proved.

In 1936 Smith reported a case of this disease in a male negro aged 39 years. The patient's Wassermann reaction was negative. Smith described no pathologic studies so that the diagnosis must be considered presumptive rather than proved.

Parsons in the same year (1936) also recorded the occurrence of this disease in a male

negro in whom there was a considerable admixture of white blood. In this patient there was also a history of luetic infection. Parsons stressed the difficulty of distinguishing thromboangitis obliterans from syphilitic endarteritis obliterans.

Scupham (1936) observed this disease in a male negro but he did not present adequate details concerning his patient.

Yater (1937) described the occurrence of thromboangitis obliterans in 5 male negroes. All the patients either had syphilis or had a history of a previous luetic infection. Two of Yater's patients required an amputation below the knee, and in the other 3 patients biopsies of the dorsalis pedis vessels were carried out. His patients all presented definite clinical and arteriographic evidences of occlusive peripheral vascular disease.

In 1941 Warshawsky pointed out that in all of the previously recorded cases in negroes there was a considerable likelihood of racial mixing with the white race. He described a case of thromboangitis obliterans in a full blooded negro male and accompanied his paper with convincing pathologic studies. Finally his patient presented no clinical or serological evidences of and gave no history of having had syphilis.

To summarize, therefore, 10 cases of thromboangitis obliterans in the negro have been recorded in the literature. All these patients were males. In 6 of the 10 patients the diagnosis was confirmed by pathologic studies. In 2 of the 10 patients there was no evidence of the presence of syphilis. Only 1 patient however could be considered to be a full blooded negro.

THE RELATIVE INCIDENCE OF THE DISEASE IN WHITE AND NEGRO PATIENTS

Our report is concerned with a group of white and negro patients who were seen in the

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Charity Hospital of Louisiana in New Orleans during a 15 year period extending from 1931 to 1945 inclusive. All patients over the age of 49 years were excluded from this series because of the increasing incidence of other forms of peripheral vascular disease in patients above this age. During this time there were 64 patients in whom the clinical or pathological diagnosis of thromboangiitis obliterans was made. Of these the diagnosis was made only on clinical findings in 48 patients and a clinical and pathological diagnosis in 16 patients. Of the 48 patients in whom the clinical diagnosis was made, 40 were white men 3 were white women and 5 were male negroes. Of the 16 patients in whom the clinical diagnosis was confirmed by pathological studies of the blood vessels 12 were white men 3 were male negroes, and 1 was a female negro. In this group of pathologically proved cases the ratio of negro to white patients was 1:3. In the entire series in this study there were 9 negro patients and 55 white patients which gives a ratio of 1:6.1

COMPARISON OF AGE INCIDENCE

Forty nine of the white patients were aged 30 to 49 years while in 6 the disease commenced between the ages of 20 to 29 years. In the negro patients 6 of the 9 patients were 30 to 49 years old and only 3 patients were 20 to 29 years old. However a statistical analysis was carried out in order to determine whether or not there was a significant difference in the age incidence between the white and negro patients. Examination of the statistics by the χ^2 test¹ with Yates modification showed no significant difference in the age incidence between the two groups.

DURATION OF SYMPTOMS

In order to determine whether or not the duration of symptoms was different in the two groups an analysis was made and showed that in the majority of the white patients (36) the duration of the symptoms was 5 years or less. In 19 of the 55 white patients the duration of symptoms was more than 5 years. Of the 9 negro patients 7 showed a duration of symptoms for 5 years or less while in only 2 of the 9

had the disease lasted longer than 5 years. Again application of the χ^2 test with Yates modification to the data revealed no significant difference between the two groups in duration of the symptoms and signs of the disease.

COMPARISON OF RESPONSE TO TREATMENT IN WHITE AND NEGRO PATIENTS

In the 55 white patients, conservative treatment was successful in 31 while it was necessary to perform major amputations of extremities in 19 patients and minor amputations in 5 patients. Of the 9 negro patients, major amputations were performed in 2 minor amputations in 6 while in only 1 patient was conservative treatment successful. When the patients requiring major and minor amputations—4 whites and 8 negroes—were placed in one group and those responding to conservative treatment in a second group—31 whites and 1 negro—comparison of the white and negro patients produced an interesting result. It was determined by means of the χ^2 test with Yates modification that a significant difference existed in this respect between the negro and white patients and that significantly more amputations were required in the negro patients than were required in the white patients with thromboangiitis obliterans. Was the proportion of minor amputations in the negro patients larger than that in the white patients? This question is answered by means of the χ^2 test with Yates modification. This test indicates that the number of minor amputations is very significantly higher in negro patients (6 patients) than it is in white patients (5 patients).

Conversely the χ^2 (Chi square) test with Yates modification indicates that there is a significantly higher ratio of major amputations to minor amputations in the white patients (19 patients) than in the negro patients (2 patients) in the present series. In comparing the success of conservative treatment and the need for surgical treatment in white and negro patients it was of interest to add to our series of negro patients the 9 negroes recorded in the literature on whom sufficient data were available. When the χ^2 test with Yates modification was applied to the data, our observation

¹Chi square test.

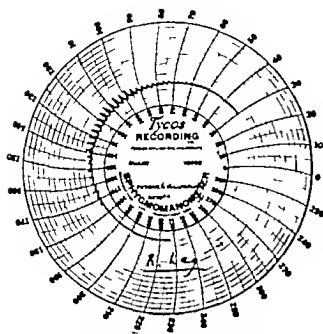


Fig. 2. Oscillogram of right leg showing arterial pulsation.

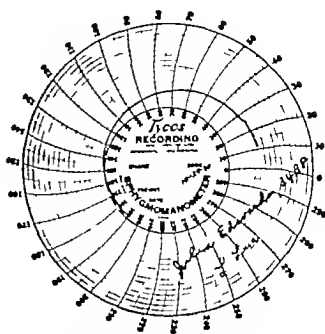


Fig. 3. Oscillogram of left leg (prior to amputation). There is an absence of arterial pulsation.

that the response of negro patients with this disease to conservative treatment is poorer than that of the white patients was confirmed. It was noteworthy that the incidence of major and minor amputations was significantly higher in negro patients than in white patients suffering from thromboangitis obliterans. The possible reasons for these differences in response to treatment between the two groups of patients will be discussed later.

Because no case report of thromboangitis obliterans in a female negro has appeared in the literature, we believe that a detailed record of this disease as observed by one of us (H. A. D.) in a negro female would be of interest.

CASE REPORT

J. E. Hospital No. L-40-54467, a negro woman aged 34 years, was admitted to the Charity Hospital of Louisiana in New Orleans in 1940. Her chief complaint was pain in the left leg. Her present illness started 4 years previously when the patient noted an intermittent pain in the left lower extremity. This pain was of a claudication type and increased when the extremity was used. At first the pain was relieved on rest but later the pain became continuous. Three years before admission the great toe of the left foot became gangrenous and had to be amputated. Three months before admission the patient's left leg felt cold and numb and became the site of a burning pain. These symptoms became progressively more severe, and, finally there appeared a

bluish discoloration of the toes and dorsum of the left foot.

A review of symptoms referable to other systems revealed the presence occasionally of precordial pain and slight dyspnea on exertion. During the past 3 months she had noted epigastric distress which occurred after meals. The patient stated that she vomited two or three times weekly. In her past



Fig. 5. Lateral roentgenogram of left leg. There is no evidence of calcification of the walls of the blood vessels.



Fig. 4. Cross section of the left posterior tibial nerve, shows thrombosis of the arteries and areas with recanalization. Perivascular fibrosis. $\times 35$. Hematoxylin and eosin stain.

history no serious illnesses were recorded. The patient denied having had syphilis although she admits that she may have had gonorrhea 1 year prior to the present admission. Her family history was noncontributory. The patient was unmarried but had been pregnant three times all of the pregnancies terminating in miscarriages. This suggests the possibility that the patient may have had syphilis. The social history of the patient contained some interesting facts. The patient was a heavy smoker having commenced smoking at the age of 13 years. The patient did not appear to be a full-blooded negro her skin being of a light chocolate color. Further inquiry however elicited from her the statement that her grandmother on the maternal side had been a white woman.

Physical examination revealed her temperature to be 98.6 degrees F, pulse rate, 90 per minute, respiratory rate, 20 per minute and the blood pressure, 140/80.

The patient was a well developed, well nourished negro woman of the stated age who did not appear to be acutely ill. The patient was complaining of pain in the left foot. Examination of the head, eyes, ears, nose and throat was negative. Her dental hygiene was good. The breasts exhibited no abnormalities. The lungs disclosed no unusual findings on physical examination. The heart was not enlarged its rhythm was regular and no murmurs could be heard. Abdominal examination revealed a slightly scaphoid abdomen but, otherwise, no abnormal findings. The pelvic organs were not examined.

The upper extremities did not present any abnormal physical findings. The right lower extremity was apparently normal. The pulsations of the right dorsalis pedis and right posterior tibial arteries were strong. The skin of the right extremity was found to be warm.

The most significant physical findings were present in the left lower extremity. The entire left leg was cold, and this coldness of the skin extended half way up the thigh. The second and third toes of the left foot exhibited a bluish discoloration and appeared to be firm and somewhat mummified in appearance. The great toe of the left foot was absent, and at its site there was the healed scar of a previous operation measuring approximately 6 centimeters in length. An irregular superficial ulcer measuring 2.5 centimeters in its greatest diameter and having a dry pink colored base was present on the dorsum of the foot immediately above the toes. The pulsations in the left dorsalis pedis and left posterior tibial arteries could not be palpated.

Oscillograms of the upper and lower extremities were made. The tracings obtained from the right and left arms were essentially normal and showed no significant differences. The oscillograms of the lower extremities were taken at the midpoint of the calf and at the midpoint of the thigh. The oscillogram of the right leg (Fig. 1) and right thigh revealed good pulsation of the blood vessels with fair amplitude of the waves. However the oscillogram of the left leg exhibited a complete absence of pulsations (Fig. 2). The oscillogram of the left thigh presented a decreased amplitude of the waves when compared with the oscillogram of the right thigh. Lateral roentgenograms of both lower extremities showed no evidence of calcification of the walls of the arteries (Fig. 3).

Laboratory findings: The hemoglobin value of the blood was 80 per cent. The red blood cell count was 4,200,000 per cubic millimeter. The white blood cell count was 13,013 per cubic millimeter. The differential count was 67 per cent polymorphonuclear leukocytes, 26 per cent lymphocytes, and 7 per cent monocytes. Urinalysis disclosed no abnormal findings. Urea nitrogen content of the blood was 77 milligrams per cent.

The flocculation and the Kolmer complement fixation tests were negative. The cerebrospinal fluid—Wassermann reaction—was negative. The cerebrospinal fluid was normal in all other respects.

Gastric analysis showed no occult blood. Free hydrochloric acid, 20 total acidity 40.

Electrocardiogram showed no definite evidence of myocardial disease.

The clinical diagnosis was (1) thromboangiitis obliterans involving the left lower extremity (2) pyrospasm.

October 24, 1940. The patient was admitted to the medical service.

October 26, 1940. The patient was transferred to the surgical service.

October 30, 1940. Left lumbar sympathetic block was carried out resulting in immediate warming of

statistically significant greater number of bacteriological cures occurs in nonparaplegic patients. As observed earlier by Petroff and Lucas, many paraplegic patients are temporarily benefited from streptomycin therapy although their urinary systems are not sterilized, and the effects are not necessarily permanent.

A word of explanation is warranted regarding the 25 per cent cures in paraplegics. The fact of the matter is that these cured patients are no longer paraplegics in the usual sense of the word. At the time of instituting streptomycin therapy for their urinary tract infections they were ambulatory with closed urinary systems and automatic bladders. By this means the factor of residual urine and urinary reflux is eliminated.

5 Clinical diagnosis. The results of therapy may be classified according to clinical diagnosis. (a) As expected, the best results are obtained with streptomycin therapy in uncomplicated cystitis, pyelitis and pyelonephritis. (b) It is unfortunate that the presence of calculi in association with these conditions, sharply increases the failure rate, since here there is an urgent need for effective chemotherapy. (c) The presence of inadequately draining abscesses and fistulous tracts increases the percentage of failures. (d) When the lesions have progressed to the stage of hydropyonephrosis the chances of cure diminish significantly. (e) As noted in the 4 cases of neoplasm of the bladder, abnormal cellular

TABLE I.—BACTERIOLOGY OF 465 URINARY TRACT INFECTIONS

Organisms	Frequency Cases	Per cent
<i>Aerobacter aerogenes</i>	173	37
<i>Escherichia coli</i>	143	30.5
<i>Escherichia coli</i> var. ("paracolus")	17	3.7
<i>Klebsiella pneumoniae</i>	30	6
<i>Proteus vulgaris</i>	5	1.1
<i>Pseudomonas aeruginosa</i>	31	7.4
Unidentified gram-negative bacilli	93	19.8
<i>Staphylococcus aureus</i>	80	7
<i>Streptococcus beta hemolytic</i>	24	7.3
<i>Streptococcus anhemolyticus</i> *	80	17.0
	465	

*Includes *Streptococcus viridans*.

growths are nonsterilizable. (f) We have shown repeatedly (4, 6) that streptomycin does not reach the prostatic secretions in therapeutic levels following parenteral administration of the drug. This is borne out in analysis of the cases of urinary tract infections complicated by lesions in the prostate and seminal vesicles which have a high failure rate.

The duration of the infection has little bearing on the outcome of treatment. However, the reversal of urinary tract pathology in deep seated infections proceeds at a slow pace and a somewhat extended course of treatment may be necessary to achieve and maintain sterile urine cultures. This fact is illustrated by the

TABLE II.—RESULTS IN MONOBACTERIAL INFECTIONS

Organism	Cases	Clinical						Bacteriological			
		Cured		Improved		Unimproved		Cured		Positive Cultures	
		No.	Percent	No.	Percent	No.	Percent	No.	Percent	No.	Percent
<i>A. aerogenes</i>	30	23	46	3	6	24	48	5	50	5	50
<i>Escherichia coli</i> and <i>Escherichia coli</i> variant	37	3	36	0	13.5	15	38.1	11	54	1	41.9
<i>Klebsiella pneumoniae</i>	1		18	1	45.4	4	36.4	18	0	81.8	
<i>Proteus vulgaris</i>		8	24	4	9	9	45.0	8	28	12	81.0
<i>Pseudomonas aeruginosa</i>	7	1	30	3	7.6	9	33.0	1	30.4	13	70.6
Unidentified gram-negative bacilli	6	3	50		6.7		33.3	3	50.0	3	50
Other gram-negative bacilli	8	3	50	2	6.7		33.3	3	50		50.0
<i>Staphylococcus aureus</i>	6	4	100	3	3	3	50	4	25		75.0
Nonhemolytic streptococcus							100				00

the skin of the left foot. The pulsations in the left dorsalis pedis artery became palpable for the first time. Repeated sympathetic blocks were done over a period of 2 weeks.

November 14 1940. The gangrene was extending to the dorsum of the foot.

November 16 1940. Under spinal anesthesia an amputation was carried out below the knee at the junction of the middle and upper $\frac{1}{3}$ of the leg. Bleeding was not excessive although a tourniquet was not applied.

December 21 1940. The wound was completely healed and the patient was discharged.

Pathological study. A dissection of the surgical specimen was performed. It was observed that the anterior tibial, the posterior tibial, and the peroneal blood vessels were thrombosed. The arteries, veins and nerves were closely bound together by adhesions which appeared to be inflammatory in origin. The arteries were dissected out along their entire length but even after thorough examination was carried out, disclosed no gross evidences of calcification of their walls.

Microscopic examination. Tissue sections were made at several levels through the tibial artery and vein of the amputated leg. Microscopic examination of the vessels at low magnification (Fig. 4) reveals that all the vessels are occluded by organized thrombi in which can be seen newly developed vascular channels. The vessels are bound together by dense fibrous connective tissue containing numerous lymphocytes plasma cells monocytes and foci of polymorphonuclear leucocytes. A striking feature of the microscopic picture was the appearance of numerous smaller blood vessels suggesting the development of a collateral circulation as a result of occlusion of the larger vessels. The internal elastic lamina of the arteries appeared to be intact. Microscopic examination at a higher magnification (Fig. 5) of the tibial artery showed the presence in its lumen of a cellular well organized thrombus infiltrated by lymphocytes plasma cells, and other mononuclear cells. The thrombus contained numerous endothelial lined spaces some of which contained fresh blood cells. The internal elastic lamina was intact. The media was somewhat fibrotic and was infiltrated to a moderate extent by mononuclear cells mainly lymphocytes and plasma cells.

Follow-up. The follow up of this patient presents points of interest. Two years after her operation she was operated upon for a typical duodenal ulcer proved by roentgenograms and at operation when a subtotal gastric resection was performed. On being questioned at this time the patient admitted that she had stopped smoking for several months after the amputation of her left leg but had resumed the habit. At the time of her admission to the hospital for treatment of the duodenal ulcer she was smoking 10 to 20 cigarettes each day. She had no symptoms of pain in the stump of her left leg nor in the right leg examination of which disclosed normally pulsating peripheral arteries.



Fig. 5. Cross section of the left posterior artery, shows organized thrombosis with recanalization and infiltration by mononuclear cells. $\times 80$. Hematoxylin and eosin stain.

ABSTRACTED CASE HISTORIES

It might be pertinent at this point to present briefly the findings in the male negroes who had thromboangitis obliterans and in whom the diagnosis was proved by means of pathological examination of the surgically removed tissues.

1. F. M., 39 years, male, negro had pain in right calf the right foot became gangrenous there was absence of pulsation of the right popliteal artery. Wassermann reaction was negative, and he gave no history of luetic infection. The patient was a smoker the right leg was amputated.

Pathological diagnosis thromboangitis obliterans.
2. A. D., 26 years, male, negro had pain in right great toe. Wassermann reaction was negative and there was no luetic history the patient was a smoker right great toe was amputated. Pathological diagnosis thromboangitis obliterans.

3. P. P., 36 years, male, negro had pain in right and left lower extremities and upper extremities. He was a smoker. Wassermann reaction was negative and there was no luetic history. He was repeatedly admitted to hospital when he had successive amputations of 5th toe of left foot (1933) the great toe of the right foot (1939) and the index finger of the right hand (1940). Pathological diagnosis thromboangitis obliterans.

The 5 negroes in whom only a clinical diagnosis of thromboangitis obliterans was made might be briefly described.

1 L. J., 31 years, male negro, had pain in the left great toe with gangrene, amputation of toe. Wassermann reaction was negative and he gave no history of lues. Pathologic studies were inconclusive.

2 J. H., 39 years, male negro, had pain followed by gangrene of the 5th toe of right foot requiring amputation. No pathological studies were made. Wassermann reaction was negative but there was a history of luetic infection.

3 C. P., 40 years, male negro, had pain and edema of left lower extremity. He recovered under conservative therapy. No pathological studies were made.

4 O. F., 40 years, male negro, had pain and later gangrene of left lower extremity. Bilateral lumbar sympathectomy was done. Right great toe was amputated. No pathological studies were made. Wassermann reaction was negative and he gave no history of luetic infection.

5 C. R., 28 years, male negro, had pain in left lower extremities. There was absence of pulsation in left dorsalis pedis and posterior tibial arteries, gangrene of 3rd, 4th and 5th toes of left foot required amputation of these toes. Wassermann reaction was negative. The pathological studies were inconclusive.

A survey of the literature on thromboangitis obliterans might suggest that this disease is extremely rare in negroes because up to the time of the present report only 10 instances of the disease have been recorded in the negro. In 6 of the 10 patients the diagnosis was confirmed by pathologic studies. In the present series 9 patients were negroes and in 4 pathological examination of the tissues verified the clinical diagnosis of thromboangitis obliterans. The fact that 9 of the 64 patients observed during a 15 year period were negroes suggests that the disease is by no means rare in this race.

What is the etiological significance of syphilis in the production of these vascular changes in the negro? In 8 of the 10 instances of thromboangitis obliterans in negroes previously reported in the literature, syphilis was present. In 7 of the 9 negro patients with thromboangitis obliterans in this present series there were no serological or clinical evidence of luetic infection and no history of luetic infection. One patient gave a history of having had a syphilitic chancre and a second patient (J. E.) had had 3 miscarriages. We agree with Yater

in his conclusion that in view of the high incidence of lues in the negro race the association of this disease with thromboangitis obliterans in the negro is coincidental.

No significant differences in the age incidence and in the duration of the disease existed between the white patients and the negro patients.

The outstanding difference between the two groups lay in their response to treatment. Conservative treatment, that is, nonsurgical treatment, was conspicuously less successful in negro than in white patients. The incidence of amputations was significantly higher in negro patients than in white. This lack of success of conservative methods of treatment in these patients was noteworthy and may be explained in several different ways.

1 The negro patient comes to the physician later for treatment than does the white patient. However this contention is not supported by a comparison of the duration of the symptoms in both groups. No significant differences were observed in this respect in the two groups.

2 The greater lack of cleanliness among negro patients may predispose to infection of the poorly vascularized tissues.

3 A comparison of the smoking habits of these negro and white patients was not possible in this study.

4 There may be a racial lack of resistance to this disease in the negro. If this were so the disease should occur more frequently than it does in this race. Indeed there is some evidence that the opposite may be true, namely that some degree of racial immunity to Boerger's disease may exist among negroes. Two facts would tend to support this view. First, the disease is less common in negroes. Second, in the present series of cases the incidence of minor amputations was significantly higher in the negro patients than in the white patients when compared with the incidence of major amputations.

SUMMARY AND CONCLUSIONS

A study is presented of 64 patients suffering from thromboangitis obliterans. In 16 of these patients the diagnosis was confirmed not only clinically but also by pathological examination of the tissues. Twelve of the 16 patients were

white men 3 were negro men and 1 was a negro woman

No significant differences were observed between the two groups with respect to the age incidence or to the duration of symptoms

The response to conservative treatment was poorer in the negro patients than it was in the white. The reasons for this difference have been discussed

The occurrence of thromboangitis obliterans in a female negro is reported for the first

time in medical literature The clinical diagnosis in this patient was confirmed by pathological studies of the tissues

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A REPORT ON THE USE OF THE HARRIS TUBE

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SINCE the appearance of Harris' article describing his ingenious tube and his experiences with it as an instrument for decompression of the bowel, there has not to our knowledge been sufficient trial of his tube. In the absence of more recent accounts by others, we felt that it would be of interest to report our early experiences with the Harris tube at the Massachusetts General Hospital.

The present report consists not of a selected number of cases, but on the contrary, is an account of the first 30 cases in which we used the Harris type of intestinal suction.

We have to date been unable to obtain radio-opaque rubber tubing and have resorted to koroseal transparent plastic tubing $\frac{3}{8}$ inch in diameter. This tubing can be visualized on a dry x-ray plate but is not visible by fluoroscopy. Its transparency is an aid to checking its function. The leading end is fitted with a hollow perforated metal tip¹ and a double thickness of condom is tied over this with two fine silk or cotton threads. After the mercury is introduced inside the inner bag and all the air is expressed, the other ends of the bags are similarly tied over an internal metal collar² placed 5 inches proximally in the tube. Six small holes about $\frac{1}{32}$ of an inch in diameter are then cut out of the side of the tube, with a pair of scissors, an inch apart just above the bag and the tube is ready for use. The unsalvageable parts of the tube cost 35 cents. We replace the tubing and the bags before reusing the apparatus. A double thickness bag has been resorted to following the accidents reported in Cases 5 and 6. Since using a double-thickness bag we have had no more ruptures with escape of mercury. Four cubic centimeters of mercury were used in most cases,

but we have had equal success with 2 and with 3 cubic centimeters.

We have employed the tube in the following manner. Surgical lubricating jelly is used, because mineral oil tends to weaken the rubber bag and the tube is passed through the nostril into the stomach and then left to progress at will. Mineral oil on the tubing at the nose level adds comfort to the patient and allows the tube to pass more freely. We have not found it necessary to place the patient on the right side or to feed the tube manually. The tube if left oiled and unattached at the nostril, has progressed of its own accord. Suction has been used only on the obstructed patients, and dietary restriction only when indicated clinically.

If the tube has failed to progress in the first 12 hours, we have used fluoroscopy to place the tip of the tube accurately at the pylorus. It has been our experience that if the tube has not passed the pylorus of its own accord, manipulation under the fluoroscope is also unsuccessful; however, placing the tip of the tube at the pylorus is often rapidly followed by spontaneous passage into the duodenum.

Strapping the tube to the nose has always halted the progress of the tube, and removal of the tube has not been more difficult than when a double-lumen tube has been used. Cases 1 and 4 are interesting in this regard.

The table summarizes the results in the first 30 cases in which we employed this tube. We would like to state here that in only 2 or 7 per cent, of these 30 cases did the tube definitely fail to pass the pylorus within 24 hours and that at operation or at postmortem examination an adequate mechanical cause for failure was present in each case.

In 2 other cases the tube passed the pylorus only to be regurgitated later. Hiccupping, Trendelenburg position and pulling on the tube by the patient were thought to be partially or completely responsible for these fail-

From the Surgical Service of the Massachusetts General Hospital.

¹The metal tip of a Miller-Abbott tube can be used here.

²We have had to make these collars of 14 lock brass drilled with No. 36 drill.

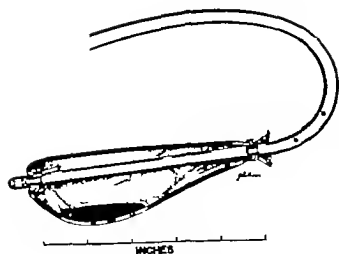


Fig. 1 Diagram of the construction features of the type of Harris tube used by the authors

ures. A double lumen tube with inflated bag might have been more successful. In the remaining 26 cases, or 87 per cent the Harris tube worked quite satisfactorily with only minor mishaps some of these we have encountered before with the Miller Abbott tube, and others we have learned to prevent.

SUMMARY OF CASES

Type of case	No. of cases	No. of cases requiring more than 24 hrs. for passage of pylorus	Complications	No. of cases requiring manipulation under fluoroscope
Paralytic ileus	7	Case 2, 24 hours, cases failed	Cases 1, 3	without success tip placed at pylorus
Preoperative intubation for bursal resection			Cases 4, 5, 6	
Small bowel obstruction	7	Case 8, 24 hours, case failed	Cases 7, 8	tip placed at pylorus
Volvulus			Case 9	
Malfunctioning gastrostomy				

The following case reports are presented to show some of the difficulties and complications we have encountered in the use of the Harris tube.

CASE 1. M. C. 538219. This 50 year old woman entered the hospital with an irreducible proctodentia of 3 weeks duration. The mass was the size of a foot ball and consisted of a protruding everted vagina containing bladder, bowel, and uterus. We were unable to correct the prolapse manually even with the



Fig. 2 Photograph demonstrating the redundant folds of the bag collapsed about the traversing tube and the pooled mercury. We feel that the ease with which the tube passes the pylorus is closely related to how well the air is evacuated from the bag in the process of constructing the tube.

patient in Trendelenburg position. Examination also showed a carcinoma of the left breast with axillary metastases, an anemia of 6 grams per cent hemoglobin, and a tensely distended abdomen with shifting dullness and some high pitched peristalsis. X ray examination showed a gas pattern consistent with paralytic ileus. A Harris tube was passed with ease, and the proctodentia was reduced and strapped in place. Pentoneoscopy established the diagnosis of metastatic carcinoma, and 5,000 cubic centimeters of ascitic fluid were removed. Despite repeated attempts in the course of 48 hours the Harris tube could not be withdrawn. X ray film showed the tube to have reached the distal ileum with no kinks or knots. The tube was therefore allowed to pass completely into the gastrointestinal tract and 10 days later was withdrawn by rectal examination in a double bow knot.

CASE 2. L. C. 539927. This 60 year old man entered the emergency ward with paralytic ileus and vomiting which he had had for 7 days. A Harris tube was introduced, but several attempts at manipulation under the fluoroscope over a 72 hour period were ineffectual in passing the tube through the pylorus. The patient improved on chemotherapy and was found on x ray examination to have a cicatrized duodenal ulcer and later at laparotomy to have a

localized subhepatic abscess exerting extrinsic pressure on the stomach. These combined mechanical factors are considered sufficient explanation for failure of the tube to pass through the pylorus.

CASE 3. I. B. 539297. This 78 year old man entered the hospital with paralytic ileus and vomiting. A Harris tube was introduced but failed to pass through the pylorus despite three manipulations under the fluoroscope. The patient lost ground steadily and expired on the tenth hospital day. Post mortem examination revealed three abscesses in the peritoneal cavity and an extensive carcinomatosis originating in a large gastric lesion which mechanically obstructed the pylorus.

CASE 4. R. deS. 553005. This 73 year old woman had a large carcinoma of the hepatic flexure. A Miller Abbott tube was started but would not pass the pylorus even after manipulation under the fluoroscope and after the addition of 2 cubic centimeters of mercury into the balloon. A Harris tube made of soft rubber tubing was then used, which under the fluoroscope was seen to go through the pylorus immediately.

This tube descended 8 feet during the 24 hours that elapsed between its insertion and the time of operation. The patient died suddenly during the induction of anesthesia, and the tube could not be withdrawn post mortem.

CASE 5. A. P. 240258. This 48 year old woman was suffering from a carcinoma of the rectum and had a Harris tube passed preoperatively. After 3 hours the tube had made no progress and she was taken to be fluoroscoped. The tip of the tube was found to be in the third portion of the duodenum and the mercury scattered in the small bowel. After removal of the tube the single thickness bag was found ruptured. A new Harris tube with a double thickness bag was used without complications. The free mercury came out of the colostomy 8 days after operation. The patient apparently suffered no ill effects.

CASE 6. A. B. 539900. This was a 65 year old man who had been intubated with a Harris tube for decompression prior to resection of a sigmoid flexure neoplasm. On the seventh postoperative day the tube was removed and when withdrawn to the cardia, the single thickness bag ruptured allowing mercury to escape into the stomach. The patient suffered no untoward effects.

CASE 7. F. S. 547760. This 24 year old man was intubated with a Harris tube for small bowel decompression. He had had a strangulated inguinal hernia with small bowel obstruction for 4 days. Peripheral circulatory collapse dictated his being placed on shock blocks. Shortly before death, 48

hours after admission and small bowel resection, the end of the tube which had previously passed through the pylorus was found to have been regurgitated back into the esophagus. He had been afflicted with the hiccoughs and the effects of gravity with hic coughing are considered to have been responsible for the final position of the tube.

CASE 8. E. D. 488067. This 17 year old girl had had an appendectomy and two subsequent laparotomies for acute small bowel obstruction during the 24 months prior to admission. She had been hospitalized by the dental service for an alveolar abscess and again developed acute small bowel obstruction, this time while in the hospital. A Harris tube was passed but was withdrawn 5 hours later in the operating room prior to ascertaining whether it had passed the pylorus. This case is included with those that failed to pass the pylorus.

CASE 9. C. M. 548680. This 50 year old man who had volvulus and strangulation of his small bowel was decompressed satisfactorily for 48 hours following the passage of a Harris tube. On the morning of the third day the tip of the tube was found to lie in the nasopharynx. It was not clear whether hiccoughing, with which the patient was afflicted, or his own attempt at removing the tube was responsible for this complication.

SUMMARY

An analysis of 30 cases in which a tube similar to the Harris tube has been employed is presented. In 87 per cent of these cases this tube functioned adequately. We feel that the Harris tube is a real addition to the physician's armamentarium. Its advantages are:

1. A rapid and spontaneous passage through the pylorus in a high percentage of cases.
2. A larger suction lumen allowing freer drainage than a double lumen tube.
3. A single lumen through which the attending nurse may irrigate the tube without the danger associated with irrigating the wrong orifice of a double lumen tube.
4. A smaller total diameter and hence a lesser discomfort to the patient than with a double lumen tube.

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DIVERTICULA OF THE DUODENUM AND JEJUNUM

With a Report of a New Technical Procedure to Facilitate their Removal and a Discussion of their Surgical Significance

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THE purpose of this paper shall be the discussion of known facts concerning duodenal and jejunal diverticula which have appeared in the literature. From this study of the literature and from our own experience we hope to evaluate the surgical significance of these diverticula. Thirdly we wish to discuss the technical features involved in operations for these lesions and report a new technical procedure which insures against overlooking any duodenal diverticulum at the operating table.

Important reports in the literary history of this subject are few before the advent of roentgenography. Most authors credit Chomel in 1710 with the first description of a duodenal diverticulum. In 1761 Morgagni described a duodenal diverticulum encountered at necropsy. This is relatively recent considering the long ages over which numerous individuals must have suffered from this sporadic lesion and it can be explained only by the fact that diverticula of the duodenum rarely are the direct cause of death. Until Case in 1913 first made the diagnosis in the living individual by roentgenography, practically all of the papers on this subject reported postmortem findings and viewed the clinical aspects only in retrospect. Sir Astley Paston Cooper is credited with being the first to describe jejunal diverticula encountered at autopsy (Ian Fraser). Sir William Osler (1881) also wrote on this subject and described a man aged 65 years who died of another cause but who at autopsy showed numerous (33) diverticula of the jejunum. For a long period of time, after his meals he had had crampy pains and loud borborygmi which Osler attributed to filling and

emptying of the diverticula.¹ Case in 1913 had diagnosed 4 cases of duodenal diverticula by fluoroscopic examination and demonstrated his findings in an exhibit at a meeting of the American Medical Association. He described the method used for ascertaining the presence of these duodenal defects in an article published in 1920. Forssell and Key in 1915 first removed a duodenal diverticulum surgically which had been diagnosed preoperatively by fluoroscopic examination. This was the first case in which a direct premeditated surgical attack had been made with the intention of removing a duodenal diverticulum known to be there prior to the operation. This was a very important landmark in the history of this subject and most papers refer to it as such.

In spite of the fact that duodenal diverticula are not rare surgical operations to remove or correct these defects are certainly not common. Most of the literature even of the present day consists of reports of 1 or 2 cases treated surgically. Articles dealing with operations for 3 and 4 cases are rare and in no instance have we encountered the report of over 4 cases in which operation was successfully carried out. The existing attitude concerning the surgical significance of duodenal diverticula is shown in numerous articles. For example Costello (1933) reported 6 cases, 5 of which definitely gave symptoms but only 1 patient was operated upon in order to relieve the symptoms and Morton (1940) reported from the University of Rochester that primary duodenal diverticula had been diagnosed in 33 different patients but only 2 were operated upon and in only 1 of the 2 was the diverticulum successfully removed. In 19 duodenal di-

Although Osler was still at McGill University at the time that this paper was published, his literary style, which developed so beautifully in his later career, already was evident in this report.

Read before the Birmingham Surgical Society, Birmingham, Alabama, April 6, 1947.

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some of them are huge but residual pooling of barium in the diverticulum is apparently a common finding and in our opinion should be an important distinguishing feature in judging whether operation for the diverticulum would actually relieve the symptoms. Roentgenographic studies to be thorough must include recumbent and lateral positions and pressure filling of the duodenum and in addition a serial roentgenogram taken in 6 hours to determine residual pooling in the diverticulum.

SEX

Studies found in the literature do not clearly distinguish a predilection of either sex to form these diverticula. Hahn collected 207 cases from the literature and estimated that 54 per cent were in women and 46 per cent in men. Spriggs and Marxer reported of 38 cases disclosed roentgenographically 20 were women and 18 were men. In 85 cases discovered roentgenographically Case found 60 per cent in women 40 per cent in men whereas the sex distribution of 55 cases reported by Centano was 15 women (33%) and 37 men (67%). Apparently the distribution is almost equal in the two sexes.

LOCATION

Most of the duodenal diverticula occur on the concave side of the descending portion. The majority of them occur in the region of the ampulla of Vater and for that reason they have been called 'perivaterian diverticula' by the French. When they occur on the second portion of the duodenum they either present into the head of the pancreas and are covered by it or more commonly originating in the perivaterian area, they lie posterior to the duodenum with a fundus extending even to the right of the duodenum giving the impression on roentgenographic study that they may be attached to the right border of the duodenum. Such apparently rarely if ever occurs. Diverticula of the second portion of the duodenum rarely ever protrude anterior to the head of the pancreas. There apparently are exceptions to this (Wilkie Baldwin). Next to the perivaterian area the concave inferior transverse portion of the duodenum is the site most often affected. The diverticula here

present upward and are covered by the transverse mesocolon and are associated with the ligament of Treitz. Diverticula apparently do not occur on the inferior border of the third and fourth portions of the duodenum. Diverticula occur even less frequently in the first portion of the duodenum. They are apparently rare there except as 'pseudo diverticula' caused by pouching due to contracture of an ulcer. However genuine diverticula do occur in the first portion of the duodenum and apparently from roentgenographic pictures presented in the literature they occur on the superior border more often than on the inferior. The following statistics bear out these statements. In roentgenographic studies of 5263 cases reported by Centano 55 patients showed duodenal diverticula. In 37 of the patients (67%) a diverticulum was found in the second portion of the duodenum. In 17 patients the diverticulum was situated in the third or fourth portion. All of the 15 diverticula discovered by Baldwin at necropsy were on the concave descending portion of the duodenum. The diverticula are more commonly found single but two or more may exist. In 70 per cent of those cases reported by Nagel the diverticulum found in the duodenum at necropsy was a single diverticulum. In 30 per cent of the instances 2 or more were found. Spriggs and Marxer reported that 84 per cent were single and 16 per cent were multiple. This was a roentgenographic study. In Baldwin's series of 15 necropsy cases 2 (14%) showed multiple diverticula. In 1 of our cases 3 diverticula were found at operation 2 additional in the same case were missed. Multiplicity is an extremely important feature of course to the surgeon. He can expect to find more than 1 diverticulum in a sufficiently high percentage of cases to be always wary of missing others even after one has been disclosed and removed.

PATHOLOGY AND ETIOLOGY

Much of the older literature on this subject is concerned with the pathology and causes of duodenal diverticula. Indeed it would seem that the papers of least practical importance devote themselves largely to such a discussion. Various definitions and terms are associated

with these diverticula but now that the real importance, that is the diagnosis and relief of symptoms caused by these conditions, has become a realization these repetitious discussions seem highly pedantic. We however like other authors before us are tempted to repeat these definitions. Diverticula are generally divided into true and false true meaning those in which the wall of the diverticulum has all the layers of the duodenal wall false diverticula are those in which the muscularis is absent from the walls and in which there is a herniation of the mucosa through a defect in the muscularis making the diverticula walls consist only of mucosa and serosa or mucosa alone. In addition to this diverticula are divided into genuine and pseudo pseudo diverticula being relative pockets on the duodenum caused usually by contraction of an ulcer scar and genuine diverticula being out pouchings of a true or false nature beyond the usual limits of the duodenal confines. Also diverticula are sometimes divided into congenital and acquired which distinction is most hard to define since congenital diverticula existing soon after birth are extremely rare.

The diverticula themselves by far the majority of which are herniations of the mucosa or false diverticula are extremely delicate and thin walled soft and compressible. Usually the os of a diverticulum is quite large and obstruction of it is rare but the os is fixed by virtue of the fixation of the duodenum, and for that reason when a large diverticulum fills and the patient remains in the erect position retention of the contents may continue for hours. Emptying and filling of jejunal diverticula on the other hand must occur with equal facility. The jejunum being relatively unfixed in position undoubtedly swings and churns and changes position sufficiently often to prevent prolonged retention. This accounts for 2 important facts first a jejunal diverticulum more rarely gives symptoms than duodenal, and jejunal diverticula are rarely disclosed on roentgenographic examination mainly because retention is absent.

ETIOLOGY

The causes of duodenal diverticula are not well understood. The condition is seldom

seen early in life it usually occurs in the fifth sixth or seventh decade. Various authors have discussed the etiology and among the theories which have been mentioned are herniation of the mucous membrane through a place of lowered resistance in the duodenal wall. This place of lowered resistance, it has been alleged most frequently is due to the penetration of small vessels through the muscular layer. A less often mentioned possible cause of weakness of the wall is the presence of pancreatic tissue at such an area or the presence of fat in the muscularis. Another often expressed theory regarding the formation of these diverticula is that they are caused by outpouching of the duodenal wall similar to the anlage from which developed the liver and the pancreas. Other causes which have been cited are traction either of the pancreatic or common duct or from the head of the pancreas itself when it has undergone focal or widespread atrophic changes due to chronic interstitial pancreatic disturbances. These theories seem to us less tenable than the theory that herniation occurs at a weak spot caused by penetration of the vessels. To substantiate the latter idea is the fact that practically all the diverticula occur on the side of the duodenum or jejunum where the arteries enter and seemingly never on the other border. In the 2 cases we report herein the jejunal diverticula which were large and numerous (Fig 2) were on the mesenteric side and in reality were outpouchings of the mucous membrane between the serosal coverings of the mesentery. The diverticula in this instance were alternately a little to one side and then the other of the line of attachment of the mesentery. Careful examination of jejunal mesenteric attachments demonstrate that the vessels alternate irregularly first on one side and then on the other of the central line of attachment to the mesentery.

Diverticula of the first portion of the duodenum may occur on the superior arch of the duodenum. In the 1 case which we have seen of the diverticulum of the first portion of the duodenum the diverticulum was a true diverticulum whose walls consisted of all coats of the intestine (Fig 3). It is probable that genuine diverticula in this area while more rare

streptomycin if warranted by the clinical and laboratory findings.

17 The percentage of satisfactory results is highest when the requirements of (1) free flow of urine, (2) susceptible organisms, and (3) adequate dosage of the drug are met. (4) Due consideration is given to the management of the patient as a whole.

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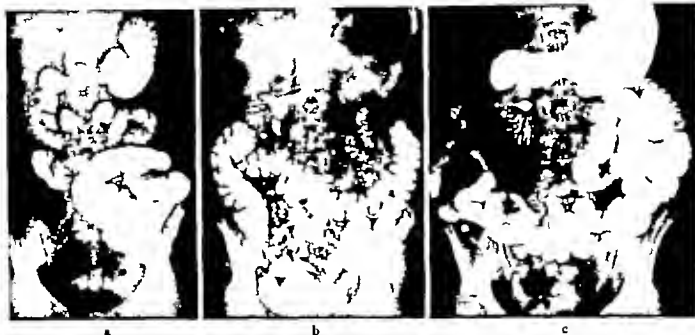


Fig 1. Roentgenograms showing duodenal diverticula (Case 1). a and b, Preoperative roentgenograms show a large cascade diverticula of the third portion of the duodenum. At operation these proved to be the right and left of the superior mesenteric vessels. They were excised. There are also 2 diverticula in the descending portion of the duodenum. A retroduodenal diverticulum was inverted at

operation. c, Postoperative roentgenogram shows that 2 diverticula in the descending portion of the duodenum persist and were missed at operation. These were probably in the pancreatic parenchyma. At the time that this operation was carried out we were not using air insufflation of the duodenum in order to disclose the location of the diverticula present.

than in the second and third and fourth portions of the duodenum are always true diverticula and they are congenital in origin. They possibly represent the anlage of pyloric coeca—pouches which occur in certain species of fish and which empty into the duodenum (Kyle). Perhaps this explains why all genuine diverticula in this position are true diverticula. In this presentation we absolutely exclude any consideration of pseudo diverticula caused by scarring of an ulcer.

SYMPTOMATOLOGY

There are no characteristic symptoms of duodenal diverticula to substantiate, with any degree of certainty a presumptive diagnosis of such a condition. Undoubtedly many of the diverticula of the duodenum remain asymptomatic. If one were to base the percentage on autopsy findings probably duodenal diverticula would be asymptomatic in 85 to 90 per cent of cases. However in a series of duodenal diverticula diagnosed roentgenographically probably the incidence of asymptomatic ones is only 25 per cent. This rough guess is based on surmises from reports in the literature and has not been substantiated by actual clinical

count. Five of 6 diverticula reported by Costello were responsible for symptoms. Spriggs and Marxer estimate that in 47 per cent of their cases the diverticula were responsible for the symptoms.

The most common symptom produced by these lesions is pain. This apparently occurs in about 80 to 85 per cent of the symptomatic cases. The pain is usually dull. It is mild to extremely severe. It may be a mere discomfort or an excruciating agony. It may last minutes to several hours. It occurs in the right subcostal region but much lower than gall bladder pain. In reality it is located in the right lower portion of the epigastric region away from the costal region and just above and to the right of the umbilicus. This pain may radiate through to the back or at times rarely to the right scapula. It is questionable whether the pain of duodenal diverticulum itself ever radiates to the scapula, since in cases in which this has been noted cholecystitis was an associated finding. The time of occurrence of pain is irregular. It apparently is associated with meals but not in a definite time pattern. Experience questioning patients regarding the occurrence of pain after



Fig. 1. Segment of the jejunum removed at operation (Case 5). It is 12 inches in length and contains 7 large and many smaller diverticula. These are false diverticula, thin walled, and consist of mucosa covered by peritoneum. As is usually the case these diverticula protrude through fenestra in the muscularis. They are commonly found on the mesenteric side of the site of entrance of the cecum.

meals left us with no definite idea of a pattern. Apparently it may come soon after a meal or hours after a meal. It may occur on consecutive days and then not occur for weeks. Apparently the pain is due to filling and failure of adequate emptying of the diverticulum. In 1 of our patients pain had the periodicity of a peptic ulcer but the patient did have peptic ulcer in addition to the large diverticulum. Associated with this pain objectively is tenderness. In 1 of our patients in whom pain was a very pronounced symptom the tenderness was striking in the right lower portion of the epigastric region and this was consistent. In the presence of pain there was always tenderness. There was no tenderness directly under the subcostal margin. The second symptom of importance and frequency in these patients is nausea. This is often recorded in the case reports in the literature. In 1 of our patients this alone was the presenting symptom. The patient stated that she has been nauseated for some 12 years. The time of occurrence of nausea was irregular but it had become more frequent in time and duration so that in recent years it occurred daily. She had sought medical aid on numerous occasions and from various physicians but until we studied her the results of examinations had been negative so that the diagnoses previously made had varied between functional gastrointestinal disturbance and neurasthenia. The nausea may be very severe. It may be accompanied by vomiting but this is rare. Nausea may occur at the height of pain but it may occur separately and without pain. This is understood

better if one subscribes to the very probable theory that nausea in reality originates in the duodenum and not in the stomach. Distension of the duodenum or diverticulum of the duodenum is the cause of nausea though the full diverticulum resting on the duodenum may cause partial obstruction and in that manner produce nausea. The third symptom of importance is diarrhea. This occurs far more commonly than one would expect. It is noted frequently in the case reports in the literature. It was a prominent feature in 1 of our patients. Apparently the diarrhea is caused by a pancreatic disturbance. It consists of 4 to 6 loose stools a day extending over a period of a few days. One author (Fulde) has written on chronic disturbance of the pancreas due to duodenal diverticula. In his cases in which he described disturbed pancreatic function diarrhea and a high fat content in the stools were prominent features. Apparently the pancreatic duct may be obstructed partially without obstruction of the common bile duct. Both acute hemorrhagic pancreatitis and jaundice have been described as resulting from duodenal diverticula but that degree of severity of pancreatic disturbance is very rare.

Various other symptoms have been mentioned in the case reports of duodenal diverticula including pain in the posterior lumbar region, sensation of fullness after eating, symptoms simulating cholelithiasis and those simulating peptic ulcer of the duodenum. Weight loss is an imposing feature of certain case reports, the patients having lost 20 to 30 pounds.



Fig. 3. Roentgenograms showing a huge diverticulum of the first portion of the duodenum in a young man exhibiting symptoms simulating peptic ulcer (Case 4). This is a genuine, true diverticulum, and one whose walls are made up of all the coats of the duodenum. This may be equivalent to

the pyloric cecum of fish. In this case a gastrectomy was done. a and b. The preoperative roentgenographic appearance of the diverticulum immediately after the ingestion of barium. c. Residual pooling of barium in the diverticulum 6 hours after the ingestion of barium.

The symptoms of duodenal diverticula may continue and usually do over a period of many years without the diagnosis being made. Indeed the diagnosis is rarely suspected merely from the subjective complaints of the patient because whatever symptoms a duodenal diverticulum causes may be attributable to the other conditions.

COMPLICATIONS

Complications of duodenal diverticula are not common but the most bizarre complications do occur. Acute diverticulitis has been reported with the severe symptoms of an acute abdomen. Recovery of patients following surgical removal of acutely perforated duodenal diverticula has been reported by Huddy, Lucman, Monsarrat. Acute perforation results in the symptoms of severe acute abdominal catastrophe. Boland (1936) has done the profession a service to call attention to the fact that an acutely inflamed diverticulum which has caused peritonitis can be overlooked unless the surgeon is cognizant of this possibility. He operated upon a patient and it was recognized that the man had peritonitis but no definite origin of the condition could be ascertained at

operation. The patient died and at necropsy an acutely perforated duodenal diverticulum was found to explain the process. If the knowledge of this possibility is realized by the surgeon when there is an otherwise undisclosed cause of peritonitis the surgeon will not fail to seek this explanation and thus possibly save his patient. Beaver reported a similar case. Melchior described phlegmonous duodenitis resulting from diverticulitis. Hemorrhage is another rare but apparently authentic complication of diverticula of the duodenum.

Obstructive jaundice is another complication which though rare may be due to either pressure by the diverticulum or to an enterolith in the diverticulum as in the case reported by Nicholson. Harris and Watson and Terry and Mugler have reported stones in diverticula. Another complication which seems to be extremely rare is carcinoma occurring in the diverticulum. Strode has reported 1 such case. The patient operated upon with removal of duodenum and head of pancreas and recovered.

DIAGNOSIS

There are two ways in which the diagnosis may be made. It may be confirmed after it is

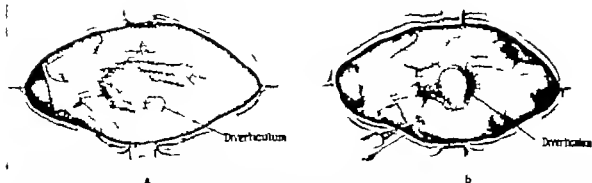


Fig. 4. Representation of a diverticulum of the descending portion of the duodenum protruding from the pancreas. a, Before, and, b, after insufflation of the duodenum with air. After the duodenum is pumped up with air the head

of the pancreas bulges disclosing the position of the diverticulum. Diverticula of the descending portion of duodenum have often been missed at operation. This is an added technical help in disclosing their position at operation.

suspected by a very astute clinician who has various investigations made such as cholecystograms and a roentgenographic search for duodenal ulcers with instructions to the roentgenologist to make a careful examination for duodenal diverticulum or the diagnosis may be stumbled upon without its possibility having been considered by the clinician and with it becoming manifest only as it were accidentally during a gastrointestinal roentgenographic study which was made with the thought that peptic ulcer may be causing the symptoms. Obviously, it is more gratifying to have considered the correct diagnosis and have it disclosed by roentgenography. Instructions to the roentgenologist that duodenal diverticulum is a possibility will undoubtedly result in disclosure of this lesion in a higher percentage of cases.

The diagnosis of duodenal diverticulum is not easy even though the diverticulum be sufficiently large to cause the symptoms for which the patient sought relief. Almost any type of upper gastrointestinal complaint from mild to severe may be attributable to duodenal diverticulum. The thought of this possibility makes the diagnosis easier. Subjectively there is nothing characteristic about the symptoms to lead one to the correct diagnosis and even a presumptive diagnosis is not justified on subjective evidence. Objectively tenderness in the right lower portion of the epigastrium is a suggestive but not a conclusive finding. The real diagnosis of duodenal diverticulum depends upon its roentgenograph

ic exposure. Then and only then is one justified in making the diagnosis with any degree of assurance. When the diagnosis has been made there is still the problem of evaluating the relationship of the diverticulum to the symptoms. The mere fact that a diverticulum is proved to be present in a duodenum does not assure one that it alone is responsible for symptoms. For that reason whenever this diagnosis is being established it is important to have a cholecystogram and roentgenographic studies of the gastrointestinal tract. Then careful consideration of the subjective and objective findings in the case may lead one to a true evaluation of the part a duodenal diverticulum is playing. Residual pooling of the barium in the diverticulum would seem to be a very important feature upon which to base judgment as to whether the symptoms are largely due to the diverticulum itself.

JEJUNAL DIVERTICULA

Diverticula are found in the jejunum more rarely than in any part of the gastrointestinal tract. Fraser indicated the frequency of diverticula in the various parts of the gastrointestinal tract as follows: first colon, second ileum (Meckel's diverticulum), third duodenum, fourth pharynx and esophagus, fifth stomach, sixth jejunum. When diverticula occur in the jejunum they are most frequent near the ligament of Treitz and diminish distally in size and number. They are most often multiple and are found in numbers from a few to hundreds in any given cases. They practi-

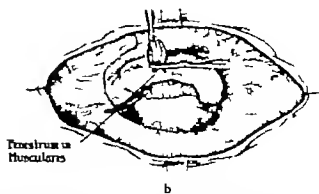
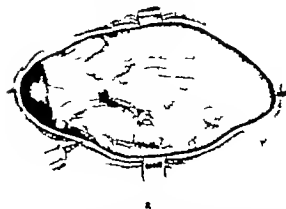


Fig. 5. Diverticulum of the descending portion of the duodenum which has presented posterior to the duodenum before and after mobilization of the duodenum. Diverticula of the descending portion usually occur around the ampulla of Vater and usually the fundus is located posteriorly to the duodenum itself necessitating an incision in

the peritoneum lateral to the duodenum on the right with elevation of the duodenum and the pancreatic head. b. The duodenum here is represented as being turned to the left. A blemostat is placed across the base of the diverticulum prior to its excision. The fenestrum in the muscularis is then closed with interrupted silk stitches.

cally always occur as false diverticula, that is as herniations of the mucous membrane through the muscular coat of the intestinal wall. The diverticula protrude through fenestra between the leaves of the attachment of the mesentery at the point of emergence of arteries. They may be huge. One as large as an apple and 6 as large as billiard balls were reported in 1 case by William Osler

The extreme infrequency of these lesions is illustrated by such facts as those reported by Rosedale viz. 3 instances of diverticulosis of the jejunum in 5 000 autopsies and Edwards 9 cases of diverticula of the jejunum in 2,820 autopsies an incidence of 0.3 per cent. Radiographic disclosure of jejunal diverticula during life is even more rare. Rankin reported that in 72715 gastrointestinal examinations of the stomach and duodenum 111 duodenal diverticula were found (0.15%) and in 956 status or serial x ray examinations of the small bowel only 3 instances of jejunal diverticula were found. The cases of diverticula of the jejunum and ileum at the Mayo Clinic up to 1932 total 52.3 found roentgenographically, 18 discovered at operation and 31 at necropsy. These did not include Meckel's diverticulum nor diverticula of the duodenum. Thirty-eight were males. Thirty had symptoms relative to the gastrointestinal tract. Forty-one had diverticula of the jejunum, 13 of the ileum. At no time did a patient go to surgery for relief of symptoms thought to be due to the diverticulum.

Jejunal diverticula cause symptoms in a much smaller percentage of cases than duodenal diverticula of comparable size. The reason being that the duodenum is fixed and the jejunum relatively free and motile constantly changes the position of the ostia of the diverticula so that emptying is facilitated. Pain, borborygmi and flatulency have been cited by numerous authors as the usual symptoms of jejunal diverticula. William Osler described a case in which a patient avoided his companions immediately after meals because of the loud noises which resulted from filling and emptying of the diverticula. Pain may be very severe and crampy. Diverticulitis of jejunal diverticula though rare has been reported by Ovens and others. Actual perforation also occurs according to Shutkin. Enteroliths occurring in a jejunal diverticulum may cause obstruction as reported by Watson and Terry and Mugler. Obstruction resulting from adhesions to jejunal diverticula has been reported by Hubeny and Pollack.

Apparently in the past even when the gastrointestinal symptoms are present surgeons and clinicians have been unwilling to attribute them to diverticula of the jejunum disclosed either at operation or by roentgenographic examination. Perhaps this incredulity has been partially due to a sensation of danger attached to the removal of these diverticula or to resection of the jejunum. Now that surgery of this part of the alimentary tract has been made relatively safe by numerous advances in re-

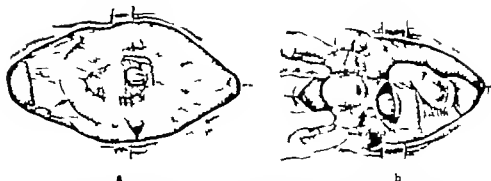


Fig. 6. Diverticula of the third portion of the duodenum usually arise from the superior concave surface. These may be approached through the transverse mesocolon by an incision into its superior layer *a*, or if they are further to the left of the superior mesenteric vessels they may be approached through the transverse mesocolon from below as represented in *b*. These diverticula may be easily excised or inverted and the fenestrum in the muscular layer closed with interrupted silk stitches. The peritoneum is carefully closed over this.

cent years, the indications for direct attack on these lesions must be broadened and undoubtedly when more such lesions are commonly alleviated by capable surgeons who then report their good results it will be more readily accepted that prompt removal of them is indicated when they produce troublesome symptoms.

TREATMENT

The treatment of diverticula of the duodenum and jejunum depends on whether they are causing symptoms or not. Presumably their disclosure by roentgenographic examination is always in a patient who has some gastrointestinal symptoms. Even when diverticula are known to be present it sometimes though not usually may be justifiably concluded that they are not the cause of the patient's symptoms. For example cholelithiasis may also have been demonstrated when the symptomatology is typical of cholecystitis and cholelithiasis. In such instances judgment as to whether the diverticulum should be removed is secondary to judgment on the indications for treatment for cholelithiasis. Usually both lesions should be removed simultaneously.

When it is concluded that the diverticula are causing symptoms the question of treatment cannot be divided into medical or surgical. It can only be decided on the basis of whether surgery can justifiably be denied the patient because of the gravity of his symp-

tom or justifiably offered him because of the minor nature of his complaints. In reality there is little medical treatment. Among measures which have been suggested are bland diet, mineral oil and lateral recumbency on one side or another after each meal. Acceptance of this management is justified only for patients whose physical condition precludes operation. Otherwise surgery is indicated if the symptoms are severe enough. Complete relief by surgery can be expected with an extremely low risk to the patient. In the past too little appreciation and experience with the effects of these diverticula have left surgeon and clinician without appraisal of the results of surgery. For that reason clinicians have hesitated to recommend removal by the surgeon and the surgeon perhaps himself did not realize what tremendous relief he could give his patient by removing the diverticula. Perhaps the fact that today the risk has been greatly diminished over that of even 10 years ago justified a more radical attitude toward these lesions either when they are disclosed by roentgenographic examination or found incidentally at the operating table.

TECHNICAL FEATURES OF THE OPERATION

Removal of the diverticulum appeals to us as the most desirable operation provided other factors permit this to be done without unjustifiably increasing the risk to the patient. Location of the diverticulum at operation is not al-

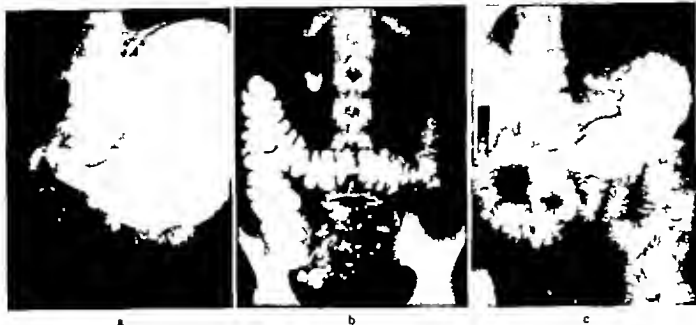


Fig. 7 Roentgenograms showing a diverticulum of the descending portion of the duodenum arising near the ampulla of Vater (Case 3). In a the position of the diverticulum has been indicated by surrounding it with white lines. The diverticulum is partially filled. b, Six hours after ingestion of the barium meal the diverticulum still retains

part of the barium. This patient had severe attacks of pain preoperatively. She has been completely relieved of all symptoms for a period now of 18 months following the operation. c, Postoperative roentgenogram disclosing no evidence of the diverticulum which was excised at operation.

ways easily accomplished. As has been indicated above these diverticula have been missed in a high percentage of the patients operated upon and even by extremely able surgeons. The diverticulum itself extending posteriorly may be entirely covered by the duodenum or protrude to the right of the duodenum. Others occur in the head of the pancreas and when collapsed in the prepared patient who has been fasting and at the operating table they may not show. For this reason we have devised the following means of demonstrating the position of the diverticulum. A 20 cubic centimeter syringe carrying a 22 gauge needle is used. The needle is inserted into the duodenum and the duodenum is pumped up with air. Thirty to 40 cubic centimeters of air is necessary. When the duodenum is ballooned out the diverticula may be disclosed even if they are in the head of the pancreas and entirely covered by parenchyma (Fig. 4). Under the circumstance of air insufflation the head of the pancreas expands so that a diverticulum therein may be discovered. This also shows diverticula in the third and fourth portions of the duodenum in the leaves of the transverse mesocolon. After the

lateral peritoneal attachment of the duodenum is severed and the duodenum is turned partially forward any posterior diverticulum may be disclosed (Fig. 5). The diverticulum is then carefully dissected from surrounding structures and the neck severed between two clamps. The edges of the mucosa which have been agglutinated by the pressure of the clamp are inverted using chromic No. 00 catgut suture. The muscular defect and the serosal layers are closed with interrupted silk stitches. Diverticula in the region of the ligament of Treitz may be difficult to disclose. We have severed the inferior fold of peritoneum on the transverse mesocolon to approach these (Fig. 6) and by pumping up the duodenum they may be found and excised. Diverticula of the third portion of the duodenum to the right of the mesenteric vessels may be approached through the superior leaf of the transverse mesocolon.

A diverticulum protruding into the head of the pancreas may be very difficult to remove but merely because of position removal is not impossible. Separation of the pancreatic parenchyma from the diverticulum may be achieved by careful dissection. We did this in

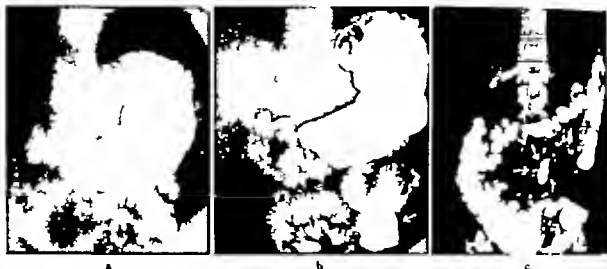


Fig. 8. Jejunal diverticula shown roentgenographically in various phases. Arrows indicate the position of the diverticula.

fecta. In this instance (Case 6) a segment of jejunum containing a large and several smaller diverticula was resected.

1 of our cases in which the diverticulum was quite large and in which it was necessary to remove pancreatic parenchyma from the entire sac. The technical feature advocated by Maclean of opening the duodenum and inserting the finger into the diverticulum may facilitate removal of a diverticulum so located. We have not employed this method. Ferguson and Cameron advocated giving the patient a mixture of barium on the evening before or morning of the operation to facilitate disclosure of the lesion at operation. The barium coats the diverticulum and makes it appear white.

Inversion of the diverticulum after the sac is entirely separated from the surrounding structures is easily accomplished. This maneuver is very tempting because it offers a certain amount of security against leakage and contamination but somehow it is not as appealing as complete removal of the diverticulum. When the diverticulum is closely associated with the common bile duct and when its removal and necessarily tight closure may compromise the patency of the duct or when other technical features would make removal an increased risk, inverting the diverticulum may be the best choice. We have inverted several in our cases some of which we feel today we would remove in preference. Barnes is to be credited with the assertion that inversion may be followed by enlargement of the

mucous membrane with the accumulation of a gelatinous material inside the inverted diverticulum and that this ultimately may lead to obstruction. His authority for this is difficult to find since he does not report this as having occurred in his cases and since he does not quote specifically another author to substantiate the statement. Nevertheless, the larger diverticula if inverted might cause partial obstruction or interference with the intestinal flow. Because of the lack of peritoneal covering on the posterior and pancreatic surfaces of the duodenum the diverticula arising there, if not too large, may be inverted as additional safety to prevent leakage since there is absence of serosal covering. Diverticula of the terminal portion of the duodenum may easily be excised, the mucosa sutured over with catgut and interrupted silk stitches employed to close the muscular and serosal layers.

Diverticula of the first portion of the duodenum may easily be excised even though they are true diverticula. If there is an occasion for excision of a segment of the stomach as there might well be when there is a stenosing ulcer excision of the diverticulum at the same time is a procedure of choice.

Numerous operations have been advocated and done for duodenal diverticula. It is obvious to most authors that excision is a most desirable procedure but fear of excision has led many to choose other less effective operations.

operations done in the past have been enterostomy gastroenterostomy with division of the duodenum excision of the diverticulum inversion of the diverticulum dissection of the diverticulum permitting it to run enteroenterostomy to short circuit the contents around the jejunal diverticulum, excision of the duodenum and head of the pancreas (for carcinoma in the diverticulum). Jejunal diverticula are less frequently operated upon. Since they are usually multiple and since their ostia are sometimes exceeding a large excision of a long segment of jejunum may be the best procedure. Dissection and removal of each diverticulum might entail a very tedious procedure with more element of danger from leaks at numerous places. If there is one large diverticulum excision is advisable or if it is extremely large with a wide base, resection of this jejunal segment with anastomosis is indicated.

CASE REPORTS

The following are brief case reports of 6 cases of duodenal and jejunal diverticula. Four of these patients had duodenal diverticula and 3 had jejunal diverticula. All of these patients had symptoms. Five of them had symptoms from the diverticulum and in each instance operation relieved them of these symptoms. The sixth patient had a gastric ulcer and at operation giant diverticula of the jejunum were discovered. It was feared that if the jejunum was anastomosed to the stomach with these giant diverticula opposite the stomach, the fixation thus of the jejunum would result in symptoms of stasis or obstruction. It is possible that these diverticula were already giving symptoms but if they were the symptoms were overshadowed by those of the severe gastric ulcer.

CASE 1. E.R.S. a white female aged 62 years, gave a history of epigastric pain and discomfort for the preceding 2 years. These symptoms were very severe at times, and there was no definite relation to eating. During the year before admission to the hospital her symptoms became worse and she lost 15 pounds in weight. Objectively there were few findings of significance. There was slight tenderness in the epigastrium. Roentgenographic examination with a contrast meal revealed diverticula of the duodenum, 3 of them being quite large (Fig. 1). After

observation here she returned to her home in a distant city but the pain became very severe and she decided to return for an operation which had been offered her with the prospect of relief but had not been urged upon her.

At operation the peritoneum was cut on the right lateral border of the duodenum and the duodenum was mobilized and turned toward the left to expose its posterior surface. There a large diverticulum was exposed (Fig. 5). The sac was remarkably thin and consisted only of herniated mucosa. It had the same diameter as the bowel. Near the medial border in the region of the ampulla of Vater was a large oval fenestration in the muscular layer. The os was quite large. The diverticulum was inverted into the lumen of the duodenum and the margins of the fenestration of the diverticulum with interrupted silk sutures. The third and fourth portions of the duodenum were approached through the inferior surface of the transverse mesocolon. Arising from the superior concave portion of the third part of the duodenum were 2 large diverticula each 3 centimeters in diameter. One was found on each side of the superior mesenteric vessels. Each of these was excised. The mucosa was closed with fine catgut and the fenestra in the muscularis through which these had herniated were closed with interrupted silk stitches.

At this time we were not using air insufflation to disclose diverticula. Postoperative roentgenographic studies revealed that we had missed a diverticulum of the descending portion of the duodenum (Fig. 1). Apparently the retroduodenal one inverted at operation did not show on preoperative examination. Those which were missed may have protruded into the head of the pancreas. These fortunately were not the largest diverticula and may have been asymptomatic since 1 year after operation this patient reported that she was free of gastrointestinal symptoms. Unfortunately however she was left with a tragic residual of the operation. This operation was done soon after the advent of "continuous spinal" anesthesia. Permanent nerve damage to the cauda resulted in bladder residual and slight rectal incontinence.

CASE 2. J.W.T. a white female aged 27 years complained of intermittent upper abdominal pain which had been occurring for some 3 years and was increasingly more severe. The pain was always in the same place to the right of the midline and low in the epigastrium or just above and to the right of the umbilicus. A 'nauseated feeling' had often been present with or without the presence of the pain. This sensation and the pain were both initiated or increased by eating. It was almost always present in recent months. At times the pain was most severe. It was dull and did not radiate but during some attacks it did require opiates for relief. Objectively the only significant finding in the entire physical examination was definite tenderness in the right lower epigastric region. It was variable in severity but when she had nausea or pain tenderness was always present. Roentgenographic examination

disclosed a large diverticulum arising from the descending portion of the duodenum.

The diverticulum was found at operation arising from the posterior surface at the midportion of the descending segment of the duodenum. In order to approach the diverticulum the duodenum was mobilized and turned to the left. The common bile duct was found to enter the duodenum at the base of the diverticula. The diverticulum was excised with care not to injure the common duct. The fenestration in the muscular coat was closed with chromic No. 00 catgut and a double row of investing fine silk sutures. The postoperative course was uneventful. Since operation 15 months ago this patient has had complete relief of her symptoms. Postoperative roentgenographic examination failed to reveal any evidence of the diverticulum (Fig. 8).

CASE 3. H.M.H. a white female, aged 51 years, had constant nausea for the past 12 years. The patient had been treated elsewhere for years with diets but no relief was experienced. This patient had no symptom other than nausea. The nausea was very severe. She said she was always nauseated. Various examinations had been made by numerous doctors with always essentially the same conclusions, either functional gastrointestinal complaint or neurasthenia. Objectively nothing significant was found on physical examination. So one was tempted to agree with previous diagnoses. We felt that roentgenographic examination of the stomach should be repeated and that it should be done extremely thoroughly and by a most expert roentgenologist. After all the diagnosis depended entirely on his findings. This examination revealed a diverticulum 1.5 centimeters in diameter arising from the second portion of the duodenum and a second large diverticulum 3 centimeters in diameter near the ligament of Treitz. At 4 hours these diverticula remained filled with barium and shadows were noted suggesting probably another large and a small diverticulum in the jejunum.

At the operation a large diverticulum near the ligament of Treitz was excised and the stump inverted with No. 00 chromic catgut and interrupted fine silk sutures. Two smaller diverticula in the jejunum were inverted with interrupted silk sutures. Air was then injected into the duodenum by means of a needle and syringe (Fig. 4). This procedure helped to locate the diverticulum in the second portion of the duodenum. It originated from the pancreatic surface and extended into the head of the pancreas to the left of the duodenum. Without the aid of air injection this diverticulum would not have been found. The diverticulum was carefully dissected free from the pancreas and was inverted into the duodenum with interrupted fine silk sutures. Because its origin was so intimately associated with the ampulla of Vater it was felt that this was a safety measure and permissible since the diverticulum was not huge. The gall bladder was also removed because it was large and redundant. In the convalescence the patient had a subhepatic

infection with resulting drainage for several weeks. Since operation, she has been entirely free of nausea for the first time in 12 years. She has gained weight, looks entirely well, eats her meals with pleasure and in every way has had a most gratifying result from her standpoint and from the standpoint of surgery.

We have no way of knowing whether her diverticula were discovered at previous examination and discounted as not being accountable for the symptoms or whether due to inadequate roentgenographic studies, they were not then disclosed. With the generally existing attitude regarding duodenal diverticula either alternative may have been the cause of her failure to get into the hands of an able surgeon for 12 years.

CASE 4. C.McC. For over 14 years the patient, a man, aged 30 years, had been having recurrent gastric hemorrhages and postprandial epigastric pain occurring periodically with long periods of remission. He had had an operation (gastroenterostomy) 24 years ago which did not definitely affect the symptomatology. Most of the hemorrhages had manifested themselves as melena and had recurred many times. Two weeks previously dark bloody stools showed again. Pain had become more severe recently and was diffusely distributed all over the abdomen. Over diet and antacids had not given the patient relief in this attack. The physical examination revealed little of note. The blood pressure was 115 millimeters of mercury systolic, 68 diastolic. Gastrointestinal roentgenographic series showed a gastroenterostomy with functioning stoma. A large diverticulum as found in the concavity between the first and second portions of the duodenum (Fig. 9). This diverticulum was the size of a satsuma, measuring 7 centimeters in transverse diameter. Six hour observations show retention of barium in the duodenal diverticulum.

Operation was performed December 20, 1946. A large diverticulum was found under the first portion of the duodenum. It was a true diverticulum with walls comprised of all layers of normal duodenum and it was a genuine not a pseudodiverticulum, i.e., it was not due to cicatricial contracture of an ulcer. A small stellate scar was noted on the anterior aspect of the duodenum just proximal to the diverticulum but there was no contracture nor stenosis of the duodenum. The first portion of the duodenum and the distal 45 per cent of the stomach was resected leaving the anterior gastroenterostomy intact. Usually we remove about 60 per cent of the stomach when doing a gastrectomy and this "limited" resection was performed to obviate the necessity of disconnecting a satisfactory gastroenterostomy stoma. The stoma was carefully inspected and seemed to be entirely free of disease. The end of the stomach was closed. Then after severing the peritoneum around

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JULY 1947

AMINO ACIDS AND HYDROLYZED PROTEIN

PROTEIN deficiencies in the surgical patient are now recognized as of great clinical importance. Because of this, a variety of methods has been developed for the administration of protein in addition to the usual normal method by which protein is ingested in the food. For example, the therapeutic value of blood transfusions resides largely in their protein content which of course occurs in at least two forms (1) as hemoglobin within the red blood cells and (2) as the various plasma protein fractions, particularly albumin. Plasma albumin, because of its large molecular size, exerts an important function in holding fluid within the capillary lumen, and substitutes for it must possess a similar colloidal property. Transfusions of blood and plasma are primarily useful for the immediate prevention or correction of acute deficits following loss of blood or plasma in a variety of surgical patients.

Protein deficiency of nutritional origin presents a different problem. This type of deficiency primarily follows protein deprivation in the diet, and is aggravated by any condition which produces an increased loss of protein tissue. When these patients are unable to ingest and assimilate protein by mouth, correction or prevention of protein deficiency is found to be impossible unless there is some method available for the introduction of this essential element through the parenteral channel.

Under normal conditions protein is utilized only after digestion during which process the large protein molecules are broken down to smaller building stones, including both the amino acids and small combinations of them usually called peptides. After absorption into the blood stream, these amino acids and peptides are carried throughout the body to be manufactured into tissue proteins, i.e., proteins, hormones, enzymes, etc., each of which has its own characteristic amino acid composition. Should the parenteral channel be required it seems clear that a similar process should be devised. Normal protein nutrition can be maintained only by the utilization of an appropriate mixture of amino acids, whether it originates from food protein or from protein digests supplied as such either by mouth or by injection.

Amino acid mixtures are available for intravenous injection and they are widely employed therapeutically to supply parenteral protein food. Strictly speaking the amino acid mixtures should be limited to the pure crystals dissolved in water; this method is impractical at the present time because of its cost. Similar mixtures as now used may o

the esophagus the esophagus was pulled down and the diaphragm pushed up and 3 to 4 centimeters of the vagus nerves were removed.

Examination 3 months after operation finds him entirely well except for slight fullness after eating a large meal.

CASE 5 G.B.G. a white male aged 64 years, had had attacks of indigestion for 25 years. For 3 months he had suffered rather severe almost continuous epigastric pain. He had had pain which was severe and which occurred soon after meals and lasted for several hours. It was not relieved by food. He also had several episodes of melena and hematemesis during this time. Roentgenographic examination with a contrast meal revealed a large ulcer crater on the lesser curvature side of the antrum about 2 centimeters above the pylorus. The roentgenologist stated that the ulcer had penetrated into the pancreas. Gastric retention of approximately 10 per cent was noted at the end of 6 hours.

At operation in addition to large gastric ulcer that had perforated into the pancreas there were 12 large diverticula in the first 12 to 18 inches of the jejunum (Fig 2). All of the diverticula were on the mesenteric side. Some of the diverticula were larger in diameter than the jejunum itself. A gastric resection was performed and a section of the jejunum 12 inches in length containing most of the diverticula and all of the large ones were removed. An end-to-end anastomosis of the jejunum was accomplished. A Hofmeister type of reconstruction completed the procedure. The postoperative course was uneventful. At follow up 1 year later the patient reports that he is completely well.

CASE 6 J.H., a man, aged 44 years, had symptoms relating to his present illness for only 2 months. He complained of pains in the upper abdomen more severe in the epigastrium but radiating from the right lower quadrant or the left upper quadrant of the abdomen to the epigastrium. These pains were extremely severe. They were sporadic and transient but they bothered him a great deal so that he was willing to have anything done which would insure him relief.

Objective examination revealed very little of significance merely slight tenderness in the epigastrium. The real diagnosis was made by means of x ray Roentgenographic gastrointestinal studies showed two large diverticula in the jejunum.

At operation 16 centimeters below the ligament of Treitz was a large diverticulum, a herniation of the mucosa on the mesenteric border. Another diverticulum was found 8 centimeters farther down the bowel. This one was 5 to 6 centimeters in diameter in the distended state. The fenestra in the muscularis which permitted these mucosal hernias were large and for that reason to remove the diverticula a segment of the jejunum containing both diverticula was resected. An aseptic end-to-end anastomosis was accomplished. The patient had an uneventful convalescence. He recovered and has been entirely relieved of his symptoms.

SUMMARY

Diverticula of the duodenum are by no means rare occurring in from 1 to 2 per cent of all patients who have roentgenographic studies made for gastrointestinal symptoms. Up until now the generally prevailing opinion in the profession is that these lesions are relatively innocuous and rarely, even though present cause symptoms. Such is not the case. They frequently are responsible for symptoms of a very troublesome and sometimes of a very disabling character. Surgical operation to obviate the presence of these diverticula either by inversion into the intestinal canal or by actual removal cures the patient. The indications for operation are discussed and when duodenal diverticula large enough to cause residual pooling of barium are present, removal or inversion is indicated even though the patient is operated on primarily for a coexisting lesion such as cholelithiasis, and though removal of the gall bladder is accomplished at the same time.

We have discussed the location, the etiology, the symptomatology, and diagnosis of these lesions.

Jejunal diverticula are much less common than diverticula of the duodenum and much more difficult to diagnose preoperatively. They may cause severe symptoms and surgical removal of them results in cure. They should not be regarded merely as incidental findings, an opinion which has been frequently expressed in the past. They probably warrant operation in a high percentage of cases in which they are diagnosed.

We have discussed the technical approach to diverticula of the duodenum and jejunum. In the past judging from reported cases these diverticula have frequently been missed at operation. We have described a new technical procedure of pumping up the duodenum with air to show diverticula which may be hidden particularly those protruding into the head of the pancreas or into the retroduodenal area. This new procedure should insure their discovery at the operating table and thus facilitate their removal.

A group of 6 cases 4 of diverticula of the duodenum and 3 of diverticula of the jejunum were reported by us. In all of these cases

operation was carried out and each patient was relieved of his symptoms.

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CARCINOMA OF THE LARYNX

Methods and Results of Treatment

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IN recent years, the frequency and seriousness of carcinoma of the larynx have become generally recognized and physicians have developed an increasing interest in the treatment of this disease. As a matter of fact, the therapeutic measures designed to cure this condition have become sufficiently diversified to arouse genuine controversies in regard to policies of treatment. It is our opinion that no one method is superior to all others; on the contrary, the type of treatment to be instituted in any given case must be governed by the type and extent of the growth which is present. In support of this opinion we wish to present the methods of treating carcinoma of the larynx at the Mayo Clinic and the end results of such management. This presentation is based on a study of 568 patients who were treated for malignant laryngeal neoplasms at the clinic during a 10 year period 1934 to 1943 inclusive (Fig. 1).

At the clinic, every patient with symptoms referable to the larynx is required to give a thorough history of his symptoms. Roentgenograms of the thorax, studies of the blood, urinalysis, serologic tests for syphilis and examination of the sputum if indicated are made and a general physical examination is performed. The larynx itself is examined by the indirect method and in many instances roentgenograms and tomographs of the larynx are obtained.

When on indirect laryngoscopy a lesion of the larynx is found to be fungating or ulcerated, to cause fixation of a vocal cord or to produce a metastatic mass in the neck, there can be little question concerning the nature of the neoplasm. However on mere visual inspection many malignant laryngeal tumors cannot be distinguished from certain benign growths, tuberculomas, or syphilomas. For

instance, early laryngeal epitheliomas of a projecting papillary character that have not infiltrated deeply enough to cause fixation of the vocal cord may be confused with benign papillomas. Papillary inflammatory growths often are more difficult to distinguish from papillary carcinomas than are papillomas. Occasionally an early infiltrative carcinoma without ulceration on a mobile cord can easily simulate one of many types of benign tumor. Distinguishing clinically between papillary leucoplakia or epithelial hyperplasia and papillary epithelioma often is impossible; however such a distinction is unnecessary since thickened leucoplakia and epithelial hyperplasia always should be considered malignant until proved otherwise by microscopic examination.

Because mere visual inspection by indirect laryngoscopy cannot offer an unerring diagnosis it becomes evident that biopsy of every laryngeal tumor is absolutely essential. We believe that removal of a specimen for biopsy is carried out most effectively under suspension laryngoscopy. We use the Lynch suspension apparatus through which an excellent view of the larynx can be obtained; it leaves both hands of the surgeon free to manipulate such instruments as are necessary for obtaining the specimen.

On our hospital service a specimen of tissue from the larynx obtained under suspension laryngoscopy is examined at once by the frozen section method. This enables a competent pathologist to give the surgeon a definite histologic diagnosis usually in a few minutes. An immediate microscopic examination of frozen sections of tissue while the laryngoscope is still in place has two distinct advantages. First, if the pathologist finds that the first specimen of tissue is unsatisfactory for diagnosis, another piece of tissue can be obtained without delay. Second if a larynx

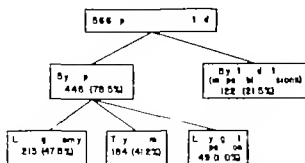


Fig. 1. Treatment of patients who had malignant laryngeal neoplasms from 1934 to 1943 inclusive.

geal growth is found to be malignant but meets certain specifications that will be discussed later it can be removed or treated without delay.

It seems to us that close co-operation between the pathologist and the laryngeal surgeon is essential in treatment of carcinoma of the larynx. Not only is histologic examination of laryngeal tumors necessary in making an accurate diagnosis, but it is equally important in determining the degree of activity of malignant lesions. At the clinic carcinomas are graded, according to their microscopic appearance from 1 to 4, grade 1 being the least malignant and grade 4 the most malignant (Broders classification). The grade of malignancy is one of the very important factors in selecting the form of therapy most suitable in each individual case of carcinoma of the larynx.

It is our belief that the surgeon who assumes the responsibility of obtaining a specimen for biopsy from a laryngeal tumor should be competent and prepared to treat the lesion. If a specimen of tissue is removed by someone else before the surgeon sees the patient it often is difficult for the surgeon to determine the extent of the lesion. Such a circumstance can jeopardize the patient's chance for a cure by a conservative operation the surgeon not knowing the exact limits of the growth, may find it necessary to perform a more radical surgical procedure than would have otherwise been necessary.

We would like to reaffirm our opinion that accurate diagnosis is essential in the care of malignant laryngeal neoplasms. Accurate diagnosis is based on thorough physical exam-

ination indirect and suspension laryngoscopic examinations and detailed histologic examination of a specimen of the tumor.

TREATMENT

At the clinic four methods are used for treatment of carcinoma of the larynx. They may be listed as follows: (1) thyrotomy (laryngofissure) and surgical removal of the growth; (2) laryngectomy; (3) removal or treatment of the local lesion under suspension laryngoscopy; and (4) external irradiation. The selection of the most suitable method in each individual case of carcinoma of the larynx is based on four factors: (1) size, location, and extent of the laryngeal growth; (2) grade of malignancy; (3) presence or absence of extralaryngeal extensions of the disease or metastasis to the cervical nodes; and (4) age and general physical condition of the patient.

All of these factors must be considered carefully in determining just what type of treatment should be employed in each case. Complete removal of the neoplasm is the prime consideration in any of the operative procedures, but unnecessary sacrifice of the voice should be guarded against. A radical operation should not be employed when a conservative one will remove the neoplasm equally well and will leave the patient with a good functional voice. On the other hand, a conservative operation should not be used when a more radical procedure is indicated as when the neoplasm is highly malignant and has probably extended beyond its apparent limits.

It always is a poor plan to try some conservative form of treatment with the assumption that, if the results are not good, something else can be attempted later on. This is detrimental to the patient's opportunity for a permanent cure as postirradiated cancer of the larynx is difficult to cure even by laryngectomy. It is well to remember that the patient who has a carcinoma of the larynx has but one good chance to get well, and if the first method fails, it is likely that subsequent methods also will fail. Consequently the laryngologist should not use one form of treatment and then another in the hope that one of them will destroy the tumor completely. On the contrary, he should carefully consider in

each individual case all of the four factors previously mentioned and decide which method is most likely to effect a cure

It is more or less generally accepted that low grade malignant tumors are radioresistant and, in consequence are better treated surgically whenever possible. We believe that grade 1 or 2 carcinomas of the larynx which have not metastasized are treated more successfully by operation than by irradiation. Furthermore in our experience most grade 3 laryngeal cancers, if not too extensive, are also more likely to be cured by surgical means. Since about 93 per cent of laryngeal carcinomas are grade 1, 2 or 3 (Table I) it is evident that at the clinic the great majority are treated by surgical measures. It is our opinion that irradiation is the treatment of choice for grade 4 carcinomas of the larynx unless the lesion is small and well localized.

One argument sometimes advanced to discredit the surgical management of malignant lesions of the larynx is the immediate risk (hospital mortality) of such operations. However as is shown in Table II in 446 cases in which operation was performed at the Mayo Clinic from 1934 to 1943 inclusive there were only 8 (1.8 per cent) hospital deaths. Furthermore during the past 7 years due to some refinements in surgical technique and due to the advent of sulfa drugs and penicillin 428 patients were operated on for carcinoma of the larynx with only 2 (0.47 per cent) hospital deaths and both of these deaths were due to coronary thrombosis. Consequently we believe that the hospital mortality associated with surgical management of carcinoma of the larynx need be of no concern.

These hospital mortality rates are low as the direct result of several factors in addition to the two mentioned. Close co-operation between trained surgeons, assistants, and nurses at the time of operation and co-operation between the surgeon and physician anesthetists are contributing factors. We believe that the use of cervical block anesthesia rather than general anesthesia contributes to the lowness of our hospital mortality rate in major laryngeal operations (thyrotomies and laryngectomies). It is obvious, of course, that satisfactory block anesthesia can be effected only

TABLE I.—CARCINOMA OF THE LARYNX 446 PATIENTS OPERATED ON GRADE OF MALIGNANCY (BRODERS METHOD)

Grade	Patients	
	Number	Per cent
	64	4.4
		47.5
3	29	21.
4	86	58
Not stated	5	1.
Total	446	100

by a highly skilled anesthetist. Care given by specially trained assistants and nurses during the postoperative period of hospitalization also is a favorable influence.

THYROTOMY (LARYNGOFISSURE)

No definite rules have been set down for determining which malignant tumors in the larynx can be removed by thyrotomy and which should be treated by laryngectomy. Such a decision requires experience and surgical judgment. However the type of tumor which is ideal for removal by thyrotomy is of a low grade of malignancy and is confined to the anterior two-thirds of a vocal cord which is freely movable. Carcinomas of similar type and location which have infiltrated the tissues of the cord a trifle so as to cause slight fixation of the anterior part of the cord usually still can be removed by thyrotomy provided that the portion of thyroid cartilage adjacent to the growth is removed along with the tumor. Extension of a low grade carcinoma across the commissure does not preclude the possibility of extirpation by thyrotomy. As a matter of

TABLE II.—CARCINOMA OF THE LARYNX 446 PATIENTS OPERATED ON HOSPITAL DEATHS*

Operation	Patients	Hospital deaths	
		Number	Per cent
Laryngectomy	3	4	9
Thyrotomy	84	4	
Suspension laryngoscopy	40		—
Total	446	8	1.8

*During the last 7 years 428 patients were operated on; only 2 (0.47 per cent) of these patients died.

fact superficial low grade epitheliomas involving the anterior half of both cords can be removed satisfactorily by thyrotomy the result of such an operative procedure is a rounded opening in the posterior portion of the larynx which offers the patient an adequate airway and a fair voice. Small well circumscribed high grade epitheliomas confined to a portion of the anterior two-thirds of a freely movable vocal cord often are curable by wide excision and electrocoagulation through thyrotomy exposure.

Thyrotomy frequently is performed for exploration of the larynx to render the neoplasm visible it often is impossible to determine preoperatively whether the growth should be removed in a conservative manner or whether laryngectomy should be done. Some well circumscribed supraglottic cancers too extensive to be extirpated through a laryngoscope, can be removed by thyrotomy although many require laryngectomy.

Briefly the technique of thyrotomy employed at the clinic is as follows. We use cervical block anesthesia. We believe that it is preferable for the patient to be conscious during the operation because general anesthesia is difficult to control when the laryngeal lumen is exposed through an external incision and because any blood that happens to trickle down the trachea is coughed up readily. After cervical block the thyroid and cricoid cartilages are exposed through a median line skin incision. With a motor-driven circular saw the thyroid cartilage then can be divided in the midline and the cut edges retracted with hooks. Incision of the underlying laryngeal mucosa exposes the interior of the larynx and the neoplasm to direct view. The lesion is excised completely with a scalpel and scissors, and the underlying bed of tissue is electrocoagulated thoroughly. The tissue which was removed is sent immediately for histologic examination by the frozen section method. If a portion of the thyroid cartilage is contiguous to the base of the electrocoagulated area it is removed with rongeurs.

This completes the removal of the growth. A tracheal cannula is inserted just below the cricoid cartilage to insure that the airway remains adequate during the postoperative heal-

ing period, a matter of 10 to 14 days. The wound is closed rather loosely with interrupted silk sutures and a split rubber tube drain is inserted subcutaneously.

LARYNGECTOMY

At the clinic, all patients who have intrinsic laryngeal carcinomas which have infiltrated deeply enough to produce fixation of one or both vocal cords but which have not metastasized to the cervical nodes undergo laryngectomy provided that their age and general condition will permit. Some low grade carcinomas which show no clinical signs of metastasis but which have perforated the thyroid cartilage or the thyrocricoid membrane or have extended into the postcricoid region can be treated by laryngectomy with a good chance of permanent cure in such cases, because the lesion is radioresistant, it would probably recur after irradiation. Furthermore we have found that the possibility of curing a patient who has a low grade malignant lesion which is undergoing metastasis to the cervical nodes is greater when block dissection of the nodes and laryngectomy are carried out than when irradiation alone is given.

As was mentioned in the discussion of thyrotomy small high grade epitheliomas on the anterior two-thirds of a vocal cord often can be removed satisfactorily by thyrotomy. However unless they are extremely small, all high grade carcinomas involving a vocal cord should be treated by laryngectomy even though there be no fixation of the vocal cord. This assertion is based on the fact that very active epitheliomas often extend far beyond the apparent limits of the growth. If a high grade malignant laryngeal lesion shows any evidence of cervical extension or metastasis, much more will be accomplished by irradiation than by surgical measures.

In performing laryngectomy we always employ local anesthesia by means of a cervical block. We do not favor use of general anesthesia for the reasons previously given in the discussion on thyrotomy. For surgical removal of the larynx, we prefer a median line skin incision to expose the thyroid and cricoid cartilages and anterior surface of the body of the hyoid bone. This incision is carried down be-

low the opening in the trachea. In order to facilitate exposure of the larynx the body of the hyoid bone is divided at the midline by means of large bone forceps and the divided ends are drawn forcibly apart by claw retractors. The attachments of the muscles at the sides of the larynx are severed and the trachea is cut across. Usually a tongue-shaped flap of laryngeal mucous membrane over the posterior part of the cricoid cartilage is elevated and left attached to the trachea; this flap ultimately aids in closure of the skin around the tracheal opening. The larynx, now detached from the trachea, is elevated and the pharyngeal mucous membrane is incised to expose the interior of the hypopharynx. By cutting across the thyrohyoid membrane, the larynx is freed completely.

On removal of the larynx a triangular shaped opening into the pharynx remains. This opening is closed by suturing its edges tightly in T shaped fashion with two rows of interrupted catgut stitches. The skin margins of the wound are sutured with silk around the trachea and the flap of laryngeal mucous membrane previously described. Mattress silk sutures are used to approximate the skin edges just above the tracheal opening. After penicillin powder has been dusted into the wound a double Penrose drain is inserted at the median line above the mattress sutures, and the wound is closed completely with interrupted silk sutures. For a few days postoperatively the patient is given intramuscular injections of penicillin.

During recent years there has been considerable controversy in the literature as to whether or not tracheotomy should be performed preliminary to laryngectomy. We believe that if the patient is young or middle aged is in good health and has a fairly adequate airway there need be no hesitation in performing laryngectomy without preliminary tracheotomy. Removal of the larynx in one stage has two advantages. First it saves the patient considerable time in hospitalization. Second it is easier in many respects to remove the larynx when the patient has not undergone preparatory tracheotomy. If the airway of a patient who has a laryngeal carcinoma is badly obstructed if his general health is poor or if

he is elderly we believe that a tracheal cannula always should be inserted in advance of laryngectomy. When a cannula is inserted removal of the larynx is postponed for 2 or 3 weeks after tracheotomy to permit all of the inflammatory reaction attending the tracheotomy to subside. It is important that there be no inflammation when laryngectomy is carried out.

SUSPENSION LARYNGOSCOPY

Destruction of certain laryngeal carcinomas with surgical diathermy under suspension laryngoscopy is advisable in selected cases. The choice of patients for this form of conservative treatment however should be made only by a laryngologist with extensive experience. Small low grade epitheliomas on vocal cords which are not fixed can be removed by surgical diathermy under suspension laryngoscopy with good results. Some laryngologists will perform thyrotomy to extirpate a very small inactive carcinoma that could have been removed by surgical diathermy under suspension laryngoscopy with much less risk and with just as good a prognosis. We wish to emphasize the fact that it is only small lesions on the vocal cords which can be treated occasionally in this conservative manner if the neoplasm cannot be brought under direct view in its entirety or if there is any question as to the extent of the growth, thyrotomy should be performed.

In cases of low grade cancer of limited extent on the anterior two-thirds of the vocal cords of elderly patients who have hypertension, diabetes or bronchiectasis or in cases in which the patient's general physical condition is so poor as to contraindicate more radical measures, treatment under suspension laryngoscopy gives the patient a greater chance of a cure than could be expected if irradiation were used.

Well circumscribed and low grade malignant tumors of the epiglottis or aryepiglottic folds or base of the tongue can be treated with gratifying results by electrocoagulation under suspension laryngoscopy. After such a neoplasm has been removed by means of surgical diathermy radon seeds often are inserted into the base of the lesion. Preliminary tracheotomy is carried out in all of these cases.

TABLE III.—CARCINOMA OF THE LARYNX 5 YEAR SURVIVAL RATES ACCORDING TO TYPE OF OPERATION

Operation	Patients*		Lived five or more years after operation	
	Total	Traced	Number	Patients traced, per cent
Laryngectomy	264	83	21	60
Thyrotomy with excision or diathermy	91	73	6	83.4
Suspension laryngoscopy with excision or diathermy	28	24		9.7
Total	383	180	27	72.8

*Largely as of January 1945. Included here are only those patients operated on 5 or more years prior to the date of inquiry; that is, 1939 or earlier.

Highly malignant neoplasms of limited extent involving the epiglottis, base of tongue and occasionally the postcricoid region often can be treated under suspension laryngoscopy by implantation of radon seeds and supplementary external roentgen therapy is given. It is surprising how frequently satisfactory results are obtained in such cases with this combined form of therapy.

In treatment of laryngeal carcinoma under suspension laryngoscopy the pharynx and larynx first are cocainized thoroughly. Then pentothal sodium is given intravenously and oxygen is administered through an intranasal tube that extends into the pharynx. Adjustment of the suspension apparatus offers an excellent direct view of the interior of the larynx. The surgeon has both hands free to insert and manipulate those instruments which are necessary to obtain a specimen for biopsy, to destroy a lesion by surgical diathermy or to implant radon seeds.

IRRADIATION

At the clinic irradiation of laryngeal carcinomas is a form of therapy reserved for high grade, radiosensitive lesions which are too extensive to warrant treatment by surgical measures. Administration of roentgen rays in fractional doses is extremely important in the treatment of some carcinomas of the larynx; many high grade tumors in which surgical operations would be of no value can be cured by fractional roentgen therapy. However we have found that only a small percentage of

laryngeal cancers are highly active growths and, in consequence we employ irradiation as a primary form of treatment rather infrequently.

The only low grade neoplasms which we treat by irradiation are those which are too extensive to be removed surgically and those which occur when the patient's age or general physical condition will not permit of surgical therapy.

In the majority of cases of carcinoma of the larynx in which intensive roentgen therapy is to be used, preliminary tracheotomy is to be recommended whether or not the patient's airway is badly obstructed by the growth. If tracheotomy is performed, there need be no concern in regard to the patient's airway should this become obstructed by postirradiation edema.

END-RESULTS OF TREATMENT

As previously stated, 568 patients were treated for carcinoma of the larynx at the Mayo Clinic from 1934 to 1943 inclusive. Of these, 446 or 78.5 per cent were treated by surgical measures—that is, by laryngectomy, thyrotomy or under suspension laryngoscopy; 122 or 21.5 per cent were treated by irradiation (Fig. 1).

Of the 446 patients who underwent operation, 213 or 47.8 per cent were treated by laryngectomy; 184 or 41.2 per cent by thyrotomy and 49 or 11.0 per cent by suspension laryngoscopy in which surgical diathermy was employed to destroy the growth or in which radon seeds were inserted into the growth. Of the 446 patients who underwent operation, 90.4 per cent were males and 9.6 per cent females. 80.9 per cent were between the ages of 45 and 69 years, 12.6 per cent were less than 4 years of age, and 6.5 per cent were more than 69 years of age.

Of all patients who underwent operation and who could be traced, 73.5 per cent survived 5 years or more without recurrence of the growth (Table III).

Of the traced patients who were treated by laryngectomy 60.2 per cent lived 5 or more years after operation; 46 per cent of the lesions were graded 1 or 2 and 54 per cent were graded 3 or 4.

Of the traced patients who underwent thyrotomy 83.6 per cent lived 5 or more years after operation. 61 per cent of these neoplasms were graded 1 or 2 and 39 per cent were graded 3 or 4.

Of the traced patients treated by surgical diathermy or insertion of radon seeds under suspension laryngoscopy 91.7 per cent lived 5 or more years after operation of the lesions in these cases, 82 per cent were graded 1 or 2 and 18 per cent were graded 3.

Of the traced patients who were treated by irradiation 6.9 per cent lived 5 or more years after operation (Table IV) of these patients 46 per cent underwent preliminary tracheotomy.

The lower survival rate associated with laryngectomy is to be expected because all malignant lesions treated by this method were large, some had extralaryngeal extensions at the time of operation and some eventually gave rise to metastasis. The high survival rate of patients treated under suspension laryngoscopy can be attributed to the fact that these patients were selected carefully and the lesions were of low grade. The low survival rate of patients treated by irradiation is to be expected since practically all of the patients had inoperable lesions, the majority of which were considered completely hopeless when first examined at the clinic. This low survival rate should not be considered as an indication of the therapeutic value of irradiation in the treatment of carcinoma of the larynx; physicians who elect the use of irradiation in cases which we would consider surgical doubtless can produce statistics which

TABLE IV—CARCINOMA OF THE LARYNX 5 YEAR SURVIVAL RATE OF PATIENTS TREATED BY IRRADIATION

Treatment	Patients*		Lived 5 or more years after treatment	
	Total	Traced	Number	Patients traced, per cent
Tracheotomy and irradiation	35	3	3	9.4
Irradiation	4	4	—	5
Total	75	7	5	6.0

*Locally as of January 1, 1935. Included here are only those patients treated 5 or more years prior to the date of inquiry; that is, 1930 or earlier.

show a much higher survival rate than Table IV reveals.

COMMENT

We would like to express our conviction that carcinoma of the larynx is a curable disease particularly when diagnosed accurately and early. However we believe that no one form of therapy is superior to all others in the treatment of this disease. On the contrary the type of growth in question its activity extent, and location and the age and general physical condition of the patient should be the factors which determine what type of treatment should be instituted in each individual case. In general, low grade laryngeal carcinomas should be treated by surgical measures while extensive high grade, radiosensitive tumors require irradiation. Successful surgical therapy for carcinoma of the larynx is not a question of operative technique alone but of the co-ordinated and collective efforts of the surgeon pathologist anesthetist assistants and nurses.

MONTEGGIA FRACTURES

An Analysis of Twenty-five Consecutive Fresh Injuries

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IN 1814 Monteggia was the first surgeon to describe 2 cases of fracture of the shaft of the ulna associated with which there was an anterior dislocation of the head of the radius. This combination of injuries has since been commonly called a Monteggia fracture.

The purpose of this paper is to discuss the injury, its complications, treatment, and to give the findings and results obtained from a series of 25 fresh Monteggia fractures treated on the Fracture Service of the Presbyterian Hospital, New York, from 1929 through 1944. The discussion will be limited to fresh cases, since space will not permit of a detailed discussion of old malunited ulnar fractures with long standing radial head dislocations except to cite the inevitable result if cases are improperly diagnosed and inadequately treated.

Though not a common one the injury is also not a rarity yet it might seem so if one were to count only the fresh cases that come to the clinic for treatment. It is an extremely important type of injury because of the fact that the true diagnosis is often completely missed on clinical and even on roentgen examinations. To overlook or fail to recognize the associated radial head dislocation results in inadequate treatment, continued dislocation, possible ugly and permanent deformity, loss of lateral stability at the elbow, restriction of function and oftentimes pain.

ANATOMY

The radius and ulna are held in contact with each other at their upper and lower extremities by strong ligaments that allow the radius to rotate upon the ulna. The orbicular (annular) ligament (Fig 3 a) surrounding the head of the radius is represented by a thickening in the elbow joint capsule and holds the radius like-

wise in contact for its articulation with the capitellum of the humerus. This ligament, however, is not so strong as the interosseous membrane that joins the radius and ulna throughout almost the entire extent of their shafts. The mechanism of injury in these cases is almost always due to the application of direct force, as for instance a fall upon the posterior aspect of the forearm. The ulnar shaft becomes fractured and its fragments are angulated or displaced forward by the force thus applied. If the radius is not fractured at the same time, the force which thus tends to shorten the ulna, must disrupt one bone from the other. The interosseous membrane being stronger than the orbicular ligament and at greater advantage owing to its longer attachment helps to lever the head of the radius away from the upper ulna and capitellum.

The mere fact that only one bone is fractured and angulated should make the physician or surgeon first examining the patient wonder what has happened to the other bone. The dislocation of the radial head is most commonly missed because of the very obvious fracture of the ulna and lack of awareness that with such a fracture one can never rule out radial head dislocation without good lateral roentgenographic views of the elbow joint. It should be *axiomatic* for the surgeon to assume that the radial head must be dislocated with this fracture unless it can be proved otherwise by adequate roentgen examination of the elbow. It may even be advisable in children to make comparative roentgenograms of the normal elbow. There should be no difficulty in determining whether or not the radial head is dislocated because on studying a lateral roentgenogram a line drawn through the long axis of the radius should pass *directly* through the center of the capitellum or its epiphysis if projected upward regardless of the amount of flexion or extension present in the elbow joint (Fig 1).

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may not include smaller peptides and are made by the digestion or hydrolysis of appropriate proteins which are then purified so as to make them safe for parenteral use. They go by various trade names, but are really solutions of hydrolyzed or digested protein. It must be emphasized that such solutions contain small molecules which possess none of the physiological properties of the large protein molecules mentioned above. They can serve only as a source for the manufacture of protein or for the nutrition of tissues requiring them. Amino acid mixtures or solutions of hydrolyzed protein cannot, therefore, be classed as blood substitutes, but merely as substitutes for the building stones of protein which normally originate in the gastrointestinal tract. However solutions of hydrolyzed protein may be made in which the process of hydrolysis is much less complete so that much larger amino acid residues are present, including particles which may even be large enough to act as colloids. Such preparations represent a meeting ground between amino acids and proteins. Some attempts have been made (Brinkman¹) to provide a protein hydrolysate which not only contains the building stones of protein which will act as a source of parenteral protein nutrition, but which also contains sufficiently large particles to act as a substitute for the albumin in the circulating plasma.

To be effective nutritionally such solutions must contain all of the essential amino acids required for normal physiological function. Whether small peptides are an advantage or not has aroused considerable interest, but can not be answered finally. At least one peptide the so-called streptogenin described by Woolley² seems to be essential for growth and cannot be synthesized by the body from amino

acids. How important it is in the maintenance of normal protein nutrition awaits further study.

Harmful reactions following the injection of hydrolyzed protein have been observed just as they have following plasma and whole blood transfusions. Any complex mixture introduced into the circulation must be prepared and given with great care and only when indicated in order to minimize such reactions. At the present time adequate preparations of hydrolyzed proteins have been extensively employed and careful study has shown that they are probably as safe or safer than plasma or whole blood transfusions. They have proved their value as a source of protein nutrition in patients who are unable temporarily to take any protein or an insufficient amount of protein by mouth. As long as surgeons are confronted with the patient who cannot take and assimilate adequate protein nourishment through the gastrointestinal tract, the parenteral injection of appropriate amino acid mixtures is the only physiological method of preventing or correcting protein starvation during such periods.

ROBERT ELMAN

GELATIN AS A PLASMA SUBSTITUTE

THE search for an effective plasma substitute during the last war led to a reinvestigation of the possible usefulness of gelatin solutions. Several groups of investigators studied different gelatins including those derived from fish skin, animal hides, and beef bone. Although favorable reports appeared concerning each of these preparations, the one which was assigned optimal rating by the National Research Council, after a physicochemical and biological survey of the field was bone (ossein) gelatin of the Knox P 20 type. This preparation

Brinkman, R., et al. *J. Lab. & Clin. Med.* 24, 30-34.
Woolley, D. W. *J. Biol. Chem.* 94, 61-82.

INCIDENCE

Monteggia fractures are far more common in children than in adults. The ages of the 3 adults in this series was 27, 35 and 63 years respectively. The ages of the 22 children ranged as follows: 3 years (1 case), 5 years (4 cases), 6 years (2 cases), 7 years (2 cases), 8 years (4 cases), 9 years (7 cases), 12 and 15 years (1 case each). There were 12 cases with this fracture in the right arm and 13 in the left arm. Three cases of the 25 did not come under our care until 5 days after injury; a fourth case sought treatment after 2 days. All of the other 21 cases came to the Emergency Ward within a few minutes to 3 hours after their injuries. The injury is usually caused by direct force, such as a fall upon the posterior aspect of the ulna or by being hit here, not infrequently by an automobile. The direct force thus accounts for the frequency of compound fractures of this type reported in the literature.

PHYSICAL EXAMINATION

The patient with a fresh injury usually holds his elbow partially flexed and in approximately mid rotation. There is a depression or concavity over the posterior aspect of the ulna at the site of the fracture. The radial head can be felt displaced toward the anterior or anterolateral aspect of the elbow. Swelling, tenderness, and ecchymosis will be present or absent as in any other acute fracture depending upon the duration of the injury, displacement of the bones, and the degree of soft part damage.

TYPES OF FRACTURE AND DISPLACEMENT

There are in general two types of deformity in fresh injuries: (1) anterior angulation of the ulnar fragments associated with anterior dislocation of the radial head (Figs. 2 a, b, c); (2) lateral angulation of the ulnar fragments associated with lateral dislocation of the radial head (Fig. 2 d). An additional possibility—(3) posterior angulation of the ulnar fragments associated with posterior dislocation of the radial head (Fig. 2 c). Watson Jones describes this third type but shows no roentgenograms. Naylor also describes it but his roentgenogram shows a fracture of the radial head in addition to its dislocation. In none of the 25 cases of fresh Monteggia fracture dis-

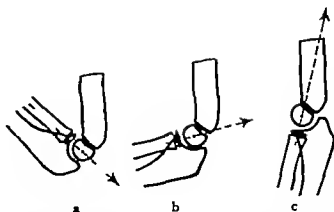


Fig. 1. Sketches of lateral views of bones at elbow in full flexion, midposition, and in full extension to demonstrate that longitudinal axis of radius normally passes through the center of the capitellar process or its epiphysis.

cussed in this paper has a single incidence been found of this posterior dislocation without fracture of the radial head. It is felt that posterior angulation of the ulna almost always results in fracture of the radial head or its epiphysis and that this particular type of injury is an entirely separate entity from a Monteggia fracture.

The fracture in the ulna is usually located in the upper third of the shaft but it may occur as far distal as the junction of the middle and distal thirds. It may also occur just below the olecranon process. The type of fracture may be of the greenstick variety or transverse. It may be oblique or comminuted.

The common dislocation of the head of the radius with this type of fracture is in an anterior direction. Less commonly it is seen to have been dislocated in a purely lateral direction. In such a displacement of the radial head the angulation of the ulna is always with its apex pointing laterally. Not uncommonly the radius is found to be dislocated in an anterolateral direction.

COMPLICATIONS

Compounding of the ulnar fracture is not too uncommon. Paralysis of the posterior interosseous nerve is of rather frequent occurrence of which more will be said further on. Nonunion may occur in adults at the site of the fracture, requiring later operative procedures for correction.

The greatest complicating factor in the opinion of the author is the possible and not

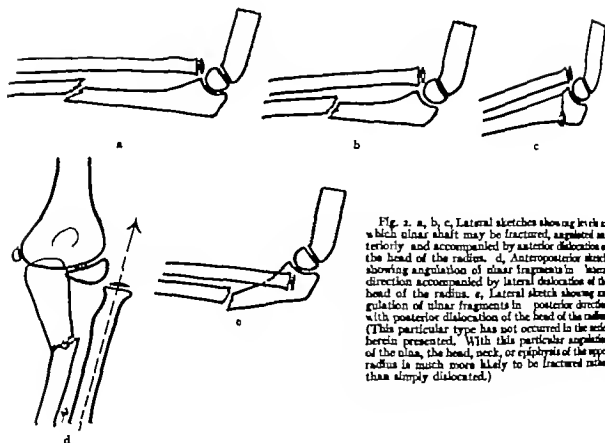


Fig. 2. a, b, c, Lateral sketches showing levels at which ulnar shaft may be fractured, angulated anteriorly and accompanied by anterior dislocation of the head of the radius. d, Anteroposterior sketch showing angulation of ulnar fragments in lateral direction accompanied by lateral dislocation of the head of the radius. e, Lateral sketch showing angulation of ulnar fragments in posterior direction with posterior dislocation of the head of the radius. (This particular type has not occurred in the series herein presented. With this particular angulation of the ulna, the head, neck, or epiphysis of the upper radius is much more likely to be fractured than simply dislocated.)

Infrequent interposition of a part or the whole of the orbicular ligament between the dislocated radial head and the capitellum which prevents its reduction by any closed manipulation

PATHOLOGY OF ORBICULAR LIGAMENT

When the radial head becomes dislocated in this type of injury the orbicular ligament may show one of three types of pathology all of which have been observed at open operation (Figs. 3 4 5 and 6). The ligament may become torn across and remain open. It may become torn across and fold in behind the radial head, thus preventing complete reduction of its dislocation and permitting subsequent loss of reduction. Third, instead of the radial head tearing through the orbicular ligament, it may be pulled out from beneath it and come to lie anterior to an intact ligament. In such case no reduction of the dislocated radial head is possible by closed or open methods until the ligament is incised vertically or is pried

back over the radial head by an elevator after the fashion of using a shoe horn. Roentgenograms are of little or no assistance in helping to determine the nature of the pathology of the orbicular ligament.

The following quotations from the operative reports of 2 cases will serve for illustration by describing the pathology and method of reduction of the radial head.

"The radial head lay in contact with the capitellum and the anterior portion of the capsule and the orbicular ligament was intact except for the lower margin of the latter which presented a sharp free edge. The radial head evidently had pulled down and out of the orbicular ligament. Reduction was performed by strong traction increasing the anterior angulation and firm pressure made over the radial head while the capsule was lifted over it with an elevator (Case 6).

"The radial head had torn through the capsule distal to the orbicular ligament and had pulled out from beneath it. It was impossible to reduce the radial head without first dividing the orbicular ligament. The posterior interosseous nerve was displaced anteriorly by the dislocated radial head which caused pressure upon it.

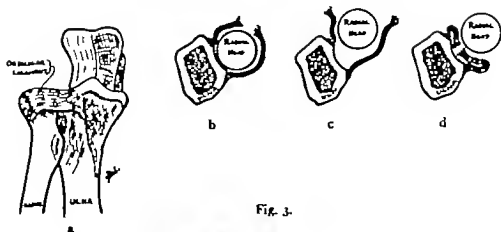


Fig. 3.

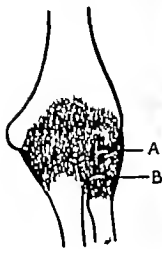


Fig. 4.



Fig. 5.



Fig. 6.

Fig. 3 a, Sketch showing normal relations of upper radius and ulna and orbicular ligament. b, c, d, Cross-sections at level of superior radioulnar joint showing torn orbicular ligament and its possible relations to the head of the radius.

Fig. 4, Sketch of anteroposterior aspect of elbow joint showing possible sites of tear in capsule which allow dislocation of radial head a, through main capsule b, below orbicular ligament.

Fig. 5 Sketch of anteroposterior aspect of elbow joint showing how radial head may become dislocated anteriorly by tearing capsule distal to orbicular ligament and pulling it out from beneath it. The radial head then lies upon the intact main portion of the ligament and the latter must be incised in order to bring about reduction of the radial head.

Fig. 6 Sketch of lateral aspect of elbow joint showing an anteriorly dislocated radial head (with Monteggia fracture). The radial head may lie anterior to an intact or partially intact orbicular ligament. The posterior interosseous nerve may be subjected to pressure or stretching by the displaced radial head before it enters the interval between the superficial and deep layers of the supinator brevis muscle to pass into the posterior compartment of the forearm. This was noted in Case 14 of this series, on admission patient showed no paralysis of this nerve, but 3 hours later did show paralysis. No attempt had been made to manipulate and reduce the fracture and dislocation.

This patient had no evidence of nerve palsy on admission but developed it after 3 hours and was operated upon 18 hours after admission (Case 14)

TREATMENT

It has been stated by Boehler that all of these radial head dislocations can be reduced

and held reduced by closed manipulation and immobilization in plaster. This would seem very doubtful in view of the above described pathology and one might doubt very much if the cases analyzed in this article had a monopoly on such pathology whether the patient is treated by open or closed methods.

There is no single method of treatment applicable to all cases. Many undoubtedly can be reduced by closed methods, remain reduced and achieve excellent results. These are the cases in which the ulnar fragments can be reduced and locked and in which the orbicular ligament is open and not folded in behind the radial head. Reduction should be tried by traction with the forearm extended. Firm pressure should be applied over the anterior aspect of the angulated ulnar fragments and as well over the radial head. When the latter slips back into place, the elbow should be flexed and then extended again. If the orbicular ligament is not interposed the radial head should stay in place provided the ulna is adequately reduced (Fig 7 a b c). If it remains in position the forearm should then be flexed to 90 degrees and immobilized in an anterior and posterior molded plaster splints extending from the axilla to the metacarpophalangeal joints. The position of the radial head and of the ulnar fragments should receive weekly or biweekly roentgenographic check ups, and if either one becomes displaced open operation should be performed and internal fixation used. If the original reduction has not been completely successful from the standpoint of either perfect reduction of the radial head or of the ulna, we believe that open reduction should be performed.

Not infrequently even with successful closed reduction of both lesions, a loss of position of one bone occurs with resultant loss of position of the other. The ulnar fragments tend to bow anteriorly and toward the radius and in an adult if not corrected, show a strong tendency to develop nonunion or malunion. We believe that all adults with this injury should be operated upon have the ulna plated rigidly where possible and the radial head reduced and the orbicular ligament repaired (Fig 8 a, b c Fig 9 a, b). If the ulnar shaft is so comminuted as to make rigid fixation by a plate and screws an impossibility it may be advisable to resort to intramedullary fixation by means of a Steinmann pin Kirschner wire or a small caliber Kuntschner nail inserted downward through the olecranon process. If this form of fixation is to be employed, it is advisable to expose the fracture site rather than take

a chance of guiding the pin "blindly" into the medullary canal of the main lower fragment.

It is justifiable to attempt closed reduction in young children but if this is not completely perfect or does not remain so with frequent check ups, they should not be allowed to go more than 10 days or 2 weeks without operative correction. Small narrow stainless steel forearm plates are the best form of internal fixation for the ulna. It is just as important to prevent subsequent bowing of the ulna in a child as in an adult if subsequent subluxation of the radial head is to be avoided (Fig. 10, a b c).

Compounding of the ulnar fracture should call for immediate and thorough operative débridement and lavage with normal physiological saline solution. The fracture should be anatomically reduced and rigidly immobilized. There is no contraindication to the use of internal fixation provided the surgeon is properly equipped and trained to use it and provided that the wound is of less than 12 hours' duration and not infected. The wound should be very loosely packed open with fine mesh, plain gauze rather than taking a chance on primary closure. After 5 or 6 days the patient should again be taken to the operating room, the wound inspected and if clinically clean, a secondary closure should be done after mobilizing the skin flaps in order to prevent the creation of any tenalon in the wound. Penicillin may be given only as an adjunct to thorough surgery but never as a substitute. Compound fractures in the upper extremity are entirely different problems from those in the lower extremity and very rarely become infected if proper surgical principles and thorough and adequate débridement are carried out.

OPERATIVE INCISION

The choices of incision for the operative approach are several in number. The ulnar fracture site may be approached through an incision directly along the posterior subcutaneous crest of this bone and the radial head dislocation may be approached through a separate anterior incision of the Z-type, care being taken to avoid cutting directly across the flexion crease of the elbow in order to avoid development of a keloidal contracted skin

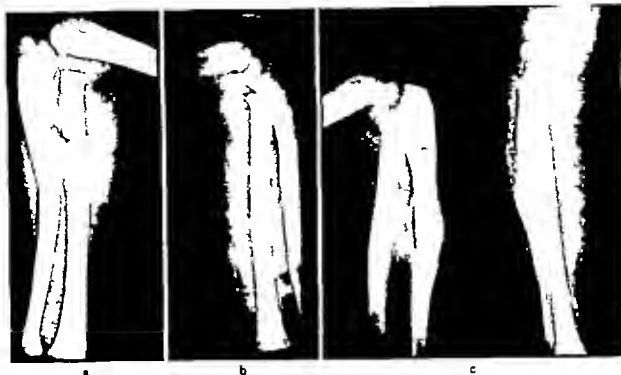


Fig. 7

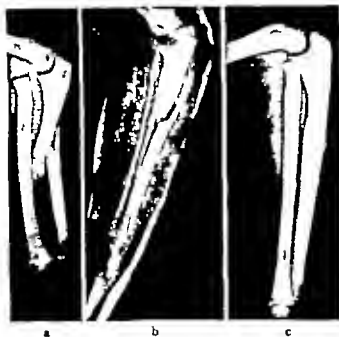


Fig. 8.

Fig. 7. Case 10. a, Original lateral view of forearm and elbow. b, Lateral view in plaster immediately after closed reduction. c, Anteroposterior and lateral views 3 1/2 weeks after closed reduction showing healing of ulna with slight angulation but maintenance of reduction of radial head.

Fig. 8. Case 16. a, Original lateral view of forearm and elbow. b, Lateral view after closed reduction. Ulnar fragments are improved, but not perfectly reduced. Radial head appears still dislocated. The diagnosis was initially missed. The elbow was operated upon 4 days later and a portion of the anterior capsule was found interposed between the radial head and capitellum. c, Lateral view 2



Fig. 9.

years after open reduction and fixation of ulna with three screws. (This form of internal fixation is not the most ideal. A narrow plate and screws would have been more satisfactory.) Radial head remains reduced.

Fig. 9. Case 24. a, Lateral view showing ulnar fracture at level of midshaft with anterior angulation. Radial head is dislocated anteriorly. Note how latter could easily have been overlooked had the elbow joint not been included on the film. b, Lateral and anteroposterior views 3 years and 4 months after open reduction and internal fixation of ulna with plate and screws. Radial head remains in normal position.



Fig. 14. Case 14. a, Original lateral view showing greenstick fracture high up in upper third of ulna with forward angulation and with anterior dislocation of radial head. (The radial head as found (operation) to have pulled out from beneath the orbicular ligament.) b, Original anteroposterior view of same case showing ulnar fragments angulated laterally as well as forward and with lateral as well as forward dislocation of the head of the radius. c, Lateral view 10 years and 5 months after operation. An internal fixation was used to maintain position of the ulna after reduction. It was necessary to divide the orbicular ligament to permit reduction of the radial head and this was then sutured. Position of the ulnar fragments reangulated slightly and partial subluxation of the radial head recurred.

scar. The deep fascia is incised longitudinally in the interval between the brachioradialis laterally and the biceps and brachialis anticus muscles medially. As this interval is deepened the superficial radial and posterior interosseous nerves are seen branching from the main radial (musculospiral) nerve. Since all muscular branches from the nerve pass in a lateral direction, the whole nerve should be retracted laterally in order not to harm any of these. The dislocated radial head and anterior capsule of the elbow joint are then readily seen and reduction and operative repair can be easily carried out as is necessary.

A single incision as described by Speed and Boyd, may be used and is an excellent one for taking care of the ulnar fracture and radial head dislocation at the same time. This incision begins about 1 inch above and lateral to the tip of the olecranon and then passes distally along the posterior aspect of the ulna as far as necessary. The muscles attached to the lateral side of the ulna, including the supinator muscle, are elevated subperiosteally thus exposing the radiohumeral joint. If care is taken to hug the ulna with the periosteal elevator there is no risk of injuring the posterior interosseous nerve which lies between the

superficial and deep layers of the supinator muscle. Through this incision it is thus possible to plate the ulna and to repair the orbicular ligament after reducing the dislocated radial head.

ANALYSIS OF CASES

There were 25 fresh Monteggia fractures in this series. Three were in adults, in one of which the fracture was compounded, the victim having been struck by a car. The majority of the children were injured at some form of recreation roller skating being the single greatest factor. Posterior interosseous nerve palsy was noted in 6 cases on admission. Five others developed palsy following operation. All of these patients with nerve complications recovered. The original diagnosis was correct in 21 cases and missed in 4. Two of these were in the first 2 cases of the series. One was picked up after a week but refused operation (Fig. 11) and did not return after 1 month of treatment. The second was not picked up until he returned to the follow up clinic 4 months after injury (Fig. 12). This case has been subsequently followed for almost 13 years. The radial head is still dislocated and prominent. He works as a clerk without handicap but



Fig. 11.

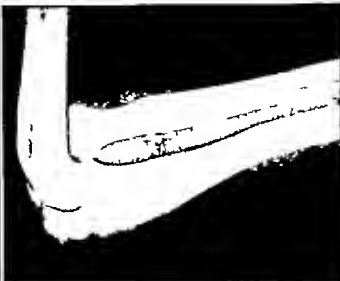


Fig. 12.



Fig. 13.

Fig. 11. Case 1. Anteroposterior and lateral views 25½ weeks after injury showing transverse type of fracture in ulna with angulation in anterior direction and with complete dislocation of head of radius. Early callus is seen at ulnar fracture site. This patient refused operation.

Fig. 12. Case 2. Lateral view 7 years and 9 months after injury showing late deformity of ulna, which has healed with persistent anterior dislocation of the head of radius. This latter dislocation was originally overlooked

and not discovered until it was too late to correct. (Late unreduced radial head dislocations if causing pain or disability may be benefited by resection of the radial head.)

Fig. 13. Case 13. Original lateral view showing simple greenstick fracture of ulna with anterior angulation and anterior dislocation of head of radius. At operation the anterior joint capsule was found interposed between the dislocated radial head and the capitellum. The ulnar fragments were fixed with a plate and four screws.



Fig. 14, left. Case 7. Original lateral view showing oblique type of fracture unusually high up in ulna and with anterior dislocation of head of radius. This patient was operated upon and the orbicular ligament was found open. The ulnar fracture was fixed internally with an aluminum plate and four screws.

Fig. 15. Case 22. Original lateral view showing fracture of upper third of shaft of ulna with slight comminution and with complete antero-dislocation of head of radius. Note also partial separation (fracture) of the distal radial epiphysis.

was unable to pass the physical examination for the sanitation department of the city of New York due to weakness and pain on heavy lifting. The 2 remaining patients who failed to have made on admission a diagnosis of ra-

dial head dislocation were picked up the following day and operated upon at 4 days (Fig 8 a, b c) and 1 day respectively both with excellent results after 7 and 5 year follow ups respectively (Figs 13 14 and 15)

TABLE L.—SUMMARY OF CASES—Continued

Case No. Age in years	Duration of injury	Associated conditions or injuries	Original diagnosis		Primary treatment		Secondary treatment	Internal fixation of ulna	Orbicular ligament untears or folded if broken displaced radial head	Radial nerve palsy		Follow-up and result	Remarks
			Correct	Incorrect	Closed	Operative				Before operation	After operation		
8 0	hr	—	+			+	Operation wait for radial head. Ulna reduced closed. Operation at 4 d. for ulna.	Plate and 4 screws	+	+		1 yr. 7 mos. Good	Radial nerve recovered 1 1/2 weeks. Slight downward bowing of ulna. Extension 1 Row limited 1/2"
0 8	hr	—		+	+		Operation at 1 day	Plate and 6 screws				4 yrs. 3 mos. Excellent	
20 5	1 1/2 hr	—	+			+	Operation stat.	Plate and 6 screws	+			1 yr. 9 mos. Excellent	Refraction of ulna through screw hole at 3 mos. Radius not redislocated. Operation, ulna replated. Plate removed 3 mos. later
6	hr	Compound wrist and fracture of lower radial epiphysis	+				Operation stat. for wrist and ulnar shaft. Radius reduced closed	Plate and 4 screws				4 yrs. Excellent	Elbow perfect. Has growth disturbance at wrist
8	1 1/2 hr	Separation of lower radial epiphysis	+			+	Operation stat.	Plate and 6 screws				None	Died after operation of aspirated vocalis
3 7	days	—	+		+							1 yr. 3 mos. Excellent	
4 9	1 1/2 hr	—	+			+	Operation stat.	Plate and 6 screws	+			1 yr. 4 mos. Excellent	
5 0 1/2	1 1/2 hr	Compound tibia. Head and subcondylar injuries	+		+							None	Good reduction of ulna and radial head, but subsequently lost position of ulnar fragments in plaster at 3 wks. Transferred to Mental Hospital 1 1/2 yrs.

In 16 of the 25 cases closed reductions were attempted as the primary treatment and 7 of these patients subsequently were operated upon either for loss of position of the ulna or radius. In 9 cases, including 2 compound fracture cases open reduction was the primary treatment. One compound fracture had only the ulna treated originally by operation and 14 days later open reduction was done on the radial head. One other patient had an open reduction performed on the radial head the same day of injury but a closed reduction only was done on the ulnar shaft. The ulna subse-

quently became angulated and at 10 days open reduction with plating was performed on it. This patient after 7 1/2 years still has a slight prominence over the ulnar fracture site and a loss of 5 degrees of full elbow extension. The total number of operative cases was 16 and internal fixation of the ulnar fragments was performed in 12.

As for the orbicular ligament pathology noted at operation in 10 cases there was found either an untorn ligament with the radial head pulled out from beneath it or a torn ligament or capsule interposed between the radial head

and capitellum or lesser sigmoid notch of the ulna.

The average duration of treatment for all cases was 8 weeks.

All but 4 of the 25 cases have been followed for periods of years, the average being 3½ years. The more recent cases were for a shorter period of course. The results in the 21 followed cases have been completely perfect from the standpoints of anatomy function and economic status in 13 cases and good to excellent in all the others except in Case 2. None of the cases resulted in nonunion. All of the cases with nerve injury recovered full function. One case had a possible osteochondritis in the elbow after 6 years and 9 months as noted by a clicking noise on pronation and supination.

Two (Cases 16 and 20) subsequently re-fractured the ulna through the site of one of the screws used for internal fixation. In Case 16 patient did this 4 years after the original trauma and he was treated for this second injury conservatively with plaster splints. There was no redislocation of the head of the radius. In Case 20 the ulna was re-fractured 13 months after the original injury but the radial head was not redislocated. Owing to the fact that the plate used for internal fixation originally also became broken he was re-operated upon the broken plate and screws removed and the ulna was plated again. Solid bony union occurred and this second plate was removed 3 months later. (See Table I.)

SUMMARY

1 Early recognition of the radial head dislocation is the most important part of the diagnosis in Monteggia fractures

2 Early treatment with completely perfect reduction of the fracture as well as the dislocation is necessary and this must be checked frequently by roentgenograms to rule out secondary loss of position of either bone.

3 Open reduction is frequently necessary if the ulnar fragments cannot be held in anatomical position.

4 Open reduction is often absolutely necessary to make possible reduction of the radial head and for removal of interposed ligament or capsule.

5 If open reduction is to be performed, it should be done early and preferably with rigid internal fixation applied to the ulna.

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comes from the manufacturer in a pyrogen free physiological saline solution in a sealed container ready for use. It has been administered to many hundreds of patients, as well as to large numbers of animals, and gives promise of being a valuable plasma substitute as far as its use in restoration and maintenance of plasma volume is concerned.

In physicochemical properties gelatin differs in several respects from natural plasma protein. Whereas the plasma proteins may be grouped into a few classes of molecules each of uniform size and shape gelatin comprises a broad spectrum of molecular sizes each having a diameter of about one half that of the plasma proteins but varying greatly in length. The shorter molecules readily permeate biological membranes but the longer ones are retained. Solutions of gelatin which have been least degraded through cooking or autoclaving will contain larger proportions of very long molecules; these preparations tend also to have a higher viscosity and will gel at room temperature. However they enjoy a considerable physiological advantage in shock therapy over the more degraded less viscous preparations, because the long asymmetrical molecules tend to be retained longer within the circulation maintain plasma volume longer and are more efficiently metabolized.

A 6 per cent solution of Knox P 20 gelatin possesses a colloid osmotic pressure approximately 50 per cent greater than that of plasma. Therefore when administered to normal subjects it tends to cause a transient hemodilution by pulling in water from the tissues. Its hemodiluting effect is approximately equivalent, gram for gram with human serum albumin. However unlike albumin the smaller and more oncologically active molecules of gelatin are rapidly excreted through the kidney so that the hemodiluting effect may not be as long maintained as with albumin. This differ-

ence does not appear to be of great practical importance in therapy of hemorrhagic shock because an animal or patient who although in shock is not suffering from prolonged depletion of protein stores appears to mobilize new plasma protein with sufficient rapidity to compensate for the gelatin excreted. Comparative studies have shown gelatin to be at least as effective as plasma in restoring circulation after severe hemorrhage with or without prolonged hypotensive periods and it has been employed in the shock phase of severe burns with excellent results. However it must be emphasized that *neither plasma nor gelatin is more than a temporary and partial substitute for whole-blood replacement in shock due to blood loss*.

Gelatin which has been properly prepared is nonpyrogenic and nonantigenic—the incidence of reactions following its administration to patients has appeared to be substantially lower in practice than with other colloids. Unlike acacia, pectin and other large molecular carbohydrates which have been employed as infusion colloids gelatin does not accumulate in the liver and other organs and no hepatopathological changes appear following prolonged periods of large amounts over given without fear of transmitting the virus of homologous serum jaundice which may be present in blood and plasma. It may be kept for long periods of time without refrigeration and can therefore be readily available for emergency use in accident wards physician kits and catastrophe depots. It also has the great advantage of low cost the cost being less than 10 per cent of that of commercial human plasma.

However, there are some disadvantages of gelatin which should be pointed out. In the first place the most suitable preparations are those which will gel after standing at room

NEURILEMMOMA OF THE PHARYNX

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WHEN Stout proposed the name neurilemmoma in 1933 for the specific tumor of peripheral nerve sheaths described by Verocay in 1910 (6 7) there had been 194 cases reported in the medical literature in the previous 100 years designated as neurinoma perineurial fibroblastoma Schwannoma peripheral glioma and by other less common descriptive terms. To these Stout added 52 tumors from his own experience indicating that the tumor was not as rare as might be supposed from the small number of previously reported cases. Since that time, the numerous reports of the occurrence of neurilemmoma have confirmed his impression.

Although a neurilemmoma theoretically can arise in any portion of the body where a nerve sheath exists, the great majority of reported tumors have been described in specific anatomical regions where one is apt to find them with relative frequency. One of the more rare sites for the discovery of a neurilemmoma has been the pharynx. The number of reported cases is now 6 (1 2 5) including 3 which are more specifically retrolaryngeal (2 3 4).

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Fig. 1. Gross appearance of the tumor in Case 1. The tumor has been bisected and the photograph shows the cut surface.

During the past 9 years we have removed 5 neurilemmomas (3 in the past 3 years) which presented in the oropharynx or nasopharynx. Because of the comparative rarity of the neurilemmoma in the pharynx and the fact that several of these tumors although too large to be removed endorally were successfully removed through the neck it seems worthwhile to record these cases.

Tumors in the nasopharynx are more often malignant than benign and of the benign tumors, neurilemmoma is certainly one of the less common. Inasmuch as the neurilemmomas are encapsulated by an expanded perineurium unless the tumor is also traversed by bundles of fibers of the peripheral nerve itself the surgeon may overlook the presence of the nerve from which the tumor arose. For this reason it is often difficult to know the actual site of parentage of a neurilemmoma even after extirpation.

The precise point of origin of the tumors reported here is not known in each instance. However all of the patients had initial symptoms referable to the pharynx all had visible tumor presenting in the pharynx and all came to operation either by the endoral or external approach after seeking otolaryngological consultation. It is quite possible, nevertheless



Fig. 2. Photomicrograph of the tumor in Case 1. Antoni types A and B tissue are both seen. Hematoxylin and eosin $\times 70$. The inset shows nuclear palisading $\times 140$.



Fig. 3. Gross appearance of the tumor in Case 2. The photograph on the right shows the external aspect before sectioning, that on the left the cut surface.

that several of these tumors may have had their origins in the deep nerves of the neck, and with growth expanded under the pharyngeal mucosa. Neurilemmomas have been reported to have definite beginnings in the cervical sympathetic, in the roots of the spinal nerves and trunks of the cervical plexus and in the spinal accessory and vagus nerves. Neurilemmomas arising from any of these sites finally could present themselves in the pharynx.

REPORTS OF CASES

CASE 1. N. F., a 49 year old white female, complained of a mass in the left side of the neck of 8 years duration. Recently the tumor had been associated with occasional pain in the ear and a smaller mass had appeared in the tonsillar region.

Physical examination revealed a hard nontender mass in the neck half the size of an orange which extended from the left ear to the level of the larynx. A similar mass 3 centimeters in diameter projected into the left side of the pharynx behind the posterior tonsillar pillar.

Röntgen examination of the neck showed, in addition to the soft tissue mass, questionable evidence of a destructive lesion involving the third to the sixth cervical vertebrae. A biopsy of the pharyngeal aspect of the tumor (Dr. Karl M. Hovest) led to a diagnosis of neurilemmoma.

During the succeeding month intensive roentgen therapy was administered to the tumor in divided doses without apparent benefit. At the end of the roentgen therapy the pain in the ear was almost constant and the patient complained of difficulty in swallowing.

The tumor was removed (Dr. J. E. Rhoads) under endotracheal anesthesia through a lateral cervical approach. The removal was apparently complete except for a fragment of tumor tissue in the plane near the biopsy site. Convalescence was uneventful except for temporary partial paralysis of the hypoglossal and glossopharyngeal nerves. The patient was last contacted about 2½ years after operation, at which time there were no complaints or evidences of recurrence.

Pathologic examination. The biopsy (S.P. No. 50031) showed an unusually cellular tumor which also contained abundant fibrillar material. Types A and B tissues of Antoni were both present and cellular palisading was a conspicuous feature.

Grossly the excised specimen (S.P. No. 50655) was a kidney-shaped, encapsulated tumor which measured 7 by 5 by 2 centimeters. It was firm and the cut surface was yellow and translucent, showing a few hemorrhagic areas. White, fibrous trabeculae partially separated the tumor into several lobules (Fig. 1). Microscopic examination revealed a picture essentially similar to that of the biopsy. The cellularity was striking and many of the cells were quite large and irregular (Fig. 2). Mitotic figures were not observed.

CASE 2. F. S., a 30 year old colored female, had complained of difficult and painful swallowing for 14 months. One year previously she had been studied in the Department of Otolaryngology for this same

complaint. Biopsy of a pharyngeal mass detected at that time revealed no evidence of tumor. The Wassermann reaction was found to be positive but the pharyngeal tumor enlarged progressively despite intensive antituberculous therapy until it threatened to obstruct her airway as well as prevent swallowing.

Physical examination revealed a hard "egg-sized" mass presenting on the left side of the posterior pharyngeal wall behind the tonsillar fossa. It extended up into the nasopharynx and down to the epiglottis and was not freely movable. An indefinite prominence was noted in the left submandibular region. The pupils were irregular but reacted to light and in accommodation. Vision in the left eye was poor.

There were no other significant physical findings. At operation (C.E.R.) under endotracheal anesthesia the tumor was approached through an incision parallel to the medial border of the left sternocleidomastoid muscle. The tumor lay beneath some of the constrictor muscles of the pharynx and was shelled out by blunt dissection with the aid of a finger in the pharynx. It was encapsulated and seemed to arise from a small nerve trunk which was not definitely identified. The integrity of the procedure was maintained throughout. Three months after operation there was no evidence of recurrence and the motility of the pharynx was normal but the enophthalmos and ptosis persist.

Pathologic examination (S.P. No. 57729) Grossly the specimen was a soft encapsulated ovoid tumor measuring 4.5 by 3 by 2.5 centimeters. Section showed a peripheral rim of translucent gray tissue but most of the tumor was friable and hemorrhagic (Fig. 3). Microscopic examination revealed the typical A and B tissues of Antoni the former predominating. The tumor cells had small, dark, elongated nuclei, often arranged in palisade formation. Myelinization and hemorrhage were prominent and many of the blood vessels were surrounded by thick collagen. An additional section prepared from what was thought to be the nerve of origin showed numerous ganglion cells in addition to nerve fibers.

CASE 3. L.T. a 50 year old colored woman complained of pain about the left thigh hip and lumbar spine, which had been present since she was injured in an automobile accident 6 months previously. Questioning elicited the fact that she had been having difficulty swallowing for the past several months. Physical examination showed in addition to her orthopedic findings, a mass about 3 1/2 centimeters in diameter in the right posterolateral wall of the oropharynx. It extended down into the upper part of the laryngopharynx. The right posterior tonsillar pillar was pressed forward and the tonsillar fossa was obliterated. The tonsil showed marked atrophy on this side. The mass was firm circumscribed and covered by normal mucosa. Roentgen studies showed lymph node enlargement. Roentgen studies showed a soft tissue mass in the region described without evi-

dence of bone destruction. Chest films revealed changes in the right lower lung field which suggested pleural thickening together with the presence of some fluid. The left lower lung field was also somewhat hazy and it was impossible to rule out the possibility of metastatic involvement.

On February 18 a biopsy of the pharyngeal mass was taken but the fragments submitted were too small for adequate examination. One area suggested the possibility of a neurilemmoma. Two subsequent biopsies were taken but none of them was most likely benign, radioresistant tumor and that the treatment of choice was surgical removal. After consultation with the surgical service it was decided to attempt removal by the oral route. A preliminary tracheotomy was done in preparation for the operation and the tumor was removed through the mouth under pentothal anesthesia. The tumor was well encapsulated and was shelled out readily by blunt dissection. Very little bleeding was encountered. The edges of the pharyngeal mucosa were approximated with catgut sutures. Penicillin had been started preoperatively and was continued through her postoperative course which was uneventful.

Pathologic examination (S.P. 54573) Grossly the specimen was an encapsulated tumor mass measuring 5.5 by 4.0 by 2.5 centimeters. Much of it was occupied by a central cystic cavity. Microscopic examination revealed that dense, relatively acellular fibrous tissue made up most of the cyst wall. Hyalinization evidenced of old hemorrhage and cystic degeneration were unusually marked and there were also foci of chronic inflammation. Despite the extent of these secondary changes, there were areas where the clear palisading and the loose myxoma like tissue characteristic of the neurilemmoma, could be seen (Fig. 4). Several clusters of foam cells were noted. A few ganglion cells were observed in the periphery of the tumor. These were presumed to be accidental inclusions, from a sympathetic ganglion or nerve which gave rise to the tumor.

CASE 4. D.O.R. a 55 year old white male, complained of difficulty on swallowing and examination disclosed a large mass on the right posterior pharyngeal wall just behind the size and shape of a hen's egg and it was about the size and shape of a hen's egg and was covered by normal mucosa. The diagnosis of sarcoma had been made elsewhere and x-ray therapy had been instituted. This apparently had been with operation the mass shelled out so readily that it was decided to administer a general anesthetic and remove the entire lesion. As the operation progressed it was discovered that the mass extended to the region of the carotid sheath and dissection became more difficult. One large vessel had to be ligated. This was apparently the internal carotid although it was of unusually small caliber for that vessel. The mass was eventually removed and the patient's condition was eventually improved.

The hospital record of this patient was not available and the clinical abstract was taken from a report by Dr. Karl M. Hoomer.

dition appeared to be good when he was returned to the ward. However he never regained consciousness and died 24 hours later. Permission for autopsy was not granted and the exact cause of death was not determined.

Pathologic examination (S P 33516) No gross description is available. Microscopic examination revealed an encapsulated tumor composed in part of compact fibrillar tissue and in part of loose textured areas poor in fibers. The cells had small, elongated and deeply stained nuclei, often arranged in palisades. Hyalinization and microcystic degeneration were striking features.

CASE 5. C.L. a 30 year old white male, was well until he developed an acute upper respiratory infection. He consulted his family physician who discovered a swelling in the right posterior pharyngeal region which he diagnosed as a tonsillar abscess. The patient was kept in bed for 2 weeks and although all signs of the upper respiratory infection had subsided there was no change in the size of the pharyngeal mass. Three weeks after the onset of his illness, his tonsils were removed but there was still no change in the size of the mass, and the patient was referred to the University Hospital.

Physical examination was negative except for the mass in the right side of the pharynx. It was smooth, nontender, nonfluctuant and covered by normal mucous membrane.

X-ray examination of the chest and neck was reported to show "a large soft tissue tumor occupying the oropharynx and nasopharynx."

The tumor was removed by the oral route (Dr. Karl M. Houser). There was considerable bleeding which necessitated packing of the cavity. Following removal of the packing there was no further bleeding or respiratory difficulty and thereafter convalescence was uneventful except for a transient right Horner's syndrome.

Pathologic examination (S P No. 29898) No gross description is available. Microscopic study showed the greater part of the tumor to be composed of relatively acellular collagenous tissue. Microcystic degeneration was noted. Palnading of the nuclei was a striking feature (Fig. 5).

The final diagnosis of these tumors cannot be made without histologic examination. The comparative frequency of the nasopharyngeal neurilemoma in our recent experience, however led to the correct diagnosis preoperatively in 2 cases.

If the tumor visualized and palpated in the pharynx by endoral examination is of sufficiently small size to be removed safely through the mouth preliminary biopsy in our opinion is not indicated. With the larger tumors, of diameter too great to permit removal safely through the mouth we believed, at first, that preliminary biopsy was in order. However

biopsy of large tumors through the pharyngeal wall is not always satisfactory and safe. Furthermore, the biopsy site is a potential pathway for infection in the neck at the time of biopsy or later removal of the tumor by the lateral cervical approach. Our 2 most recent patients were operated upon (one through a lateral cervical approach and one endorally) on the basis of clinical diagnoses, subsequently proved to be correct. Biopsies were attempted in both cases but were of insufficient depth to be diagnostic.

In spite of the fact that benign tumors are less common than malignant ones in the nasopharynx, the signs of benignity of the neurilemmomas here reported were definite. The round or fusiform shape of the tumors, their apparent encapsulation and the fact that they do not ulcerate the pharyngeal mucosa or fix themselves to it usually are demonstrable signs.

Ehrlich and Martin recommend aspiration biopsy of these tumors and diagnosed a retropharyngeal and a retrotonsillar neurilemoma by this method. Neither patient was operated upon however because it was considered as unjustifiably hazardous procedure for benign tumors with minimal symptomatology.

Difficulty in swallowing was the presenting symptom in 3 of our 5 patients. Four were also conscious of a mass but the presence of a mass in itself caused but one patient to seek medical care. Two of the tumors were found in patients who were under medical care for other reasons. Direct questioning disclosed that one of these patients had been aware of dysphagia but the other had no previous complaints attributable to the tumor. One patient had unequal pupils before operation. The histories presented by our patients would suggest that small, benign, asymptomatic neurilemmomas may eventually cause trouble and for that reason should probably be removed when encountered except in the face of specific contra-indications. Experience with Case 1 emphasizes again the resistance to radiation of the neurilemoma, an observation which has been pointed out previously (2).

Three of the tumors in this group are characteristic examples of the neurilemoma (5). A fourth Case 1 has the usual histopathologic

features of the specific tumor of nerve sheath origin and is readily recognizable as such although it is unusually cellular and the cells are frequently large, irregular and hyperchromatic. However mitotic figures were not observed and this patient has had no further difficulty in the 2½ years since operation.

The fifth tumor Case 3 presents diagnostic difficulties. Similarities to the characteristic structure of the neurilemmoma are limited to fragmentary portions of the lesion. We believe that the degenerative changes so commonly seen in tumors of this type have in this instance, been sufficiently advanced and wide spread almost to obliterate the underlying structural features. The ganglion cells occasionally encountered in the periphery of this tumor are regarded as most likely to be inclusions from a sympathetic nerve or ganglion of origin rather than an integral part of the neoplasm.

SUMMARY

Five instances of neurilemmoma of the pharynx are reported bringing to 11 the total num-

ber recorded in the literature. Four of the tumors in this group caused dysphagia, 1 of them being associated with respiratory difficulty in addition. In the 2 cases most recently encountered the correct diagnosis was made preoperatively on the basis of clinical findings. We believe that even small asymptomatic neurilemmomas should be removed surgically since they may produce symptoms as they enlarge. Three of the tumors in this group were removed endorally, 2 through a lateral cervical approach. There was 1 postoperative death.

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COMPARATIVE HEMATOLOGIC FINDINGS IN NORMAL, SPLENECTOMIZED AND SPLEEN-TRANSPLANTED DOGS

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THE transplantation of the spleen as well as of other organs with anastomosis of blood vessels has been attempted by several investigators. Carrel (6) reported autotransplantation of the spleen of a dog and found that it remained in normal condition for more than 20 months after the operation. In another dog however the transplanted spleen had completely disappeared about 3 months following operation. On exploratory laparotomy 2 weeks after operation occlusion of the artery has been found to be probable (7). The anastomosis of the vessels was made by the suture method of Carrel, and no account was found in the literature that such anastomosis of the transplanted spleen was made by a nonsuture method. The first described nonsuture method for organ transplantation has been given by Ullmann who used the prosthesis of Payr for anastomosing the vessels of the kidney with the carotid artery and the jugular vein. The prosthesis of Payr consists of magnesium tubes. Although Carrel succeeded in transplanting spleens, he did not attempt to transplant a second spleen. We employed the nonsuture method of Blake-more Lord and Stefkó with vitallium tubes as prosthesis of the splenic artery and vein to the femoral or middle colic vein respectively.

In an attempt to learn more about the physiologic functions of the spleen we inserted this organ in other sites of the circulatory system and also attached a second spleen by homotransplantation in dogs. The displaced and sometimes increased spleens were studied by their effect on certain hematological tests. For the appraisal of the hematologic data we found it necessary to establish control values on a large number of healthy mongrel dogs. These findings were obtained in 20 compara-

tive series on 16 dogs. In addition we present hematologic data secured at various intervals of time following splenectomy of healthy dogs.

A. Operative methods Through an upper left rectus incision the great omentum is carefully displaced to the right. Exposure of the spleen is best accomplished by packing off the stomach medially. With the proper retraction the spleen presents itself in the wound and is readily delivered. The splenic artery and vein are identified isolated ligated and divided between clamps. The remainder of the pedicle is then successively clamped divided and ligated. The spleen is removed and is immediately irrigated via the splenic artery with 100 cubic centimeters of warm physiologic saline containing 10 units of sodium heparin per cubic centimeter. This step is important and may mean success or failure of the procedure to follow.

In another animal the skin of the lower abdomen and upper inner thigh is carefully prepared. The operative field is cleansed with soap and water treated with benzene, and carefully washed with alcohol and ether. It is then painted twice with iodine, and alcohol is applied to remove the latter.

A longitudinal incision, 7 centimeters in length is made high in the thigh, starting 3 centimeters above the inguinal ligament and following the course of the artery downward. If the initial incision has been correctly placed, the muscle groove between the sartorius and abductor longus muscles can readily be identified. Access to the great vessels can easily be gained. The artery and vein are freed for a distance of 6 to 8 centimeters. They are individually clamped with rubber blood clamps at the proximal end and doubly ligated with medium silk at the distal end and then divided. The vessels are thoroughly irrigated with physiologic saline and then affixed with vitallium tubes (4). The spleen is now brought into

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the field. The splenic artery and vein are anastomosed to the femoral artery and vein respectively. It is important at this point not to damage the intima of either the splenic vessels or the femoral vessels for such trauma may lead to thrombosis.

A small incision is made in the lower abdomen just above the inguinal ligament. This incision should be long enough to facilitate the entrance of the spleen into the abdominal cavity. Care must be taken not to cause any angulation or tension on the splenic and femoral vessels for this may lead to occlusion of the anastomoses. Such partial or complete occlusion may initiate thrombosis as we observed in a number of operations previously. The vessels are swung over the inguinal ligament. In this manner the palpatory method is employed to test the patency of the vessel daily.

The wound is closed by first closing the peritoneum with a continuous suture of fine silk and then approximating the fascia, subcutaneous tissue, and skin by means of interrupted sutures of fine silk. A collodion dressing is applied to the wound.

B Hematological methods. The red and white blood counts and differential smears were made according to standard procedures. The sedimentation rate was done according to Westergren and hematocrit values were obtained with the method of Wintrobe in duplicate tests (32). The coagulation times were run at room temperature within 21 to 25 degrees C. Each cubic centimeter of blood tested in duplicates using pyrex tubes 10 by 100 millimeters. Platelet counts were made according to the Copley Robb method (13, 14) 0.5 per cent solution of brilliant cresyl blue (national aniline NV 27) being used (9). Clot retraction was tested according to Aggeler, Lucas, and Hamlin (2) in duplicate tests. A correction was used for the clot volume in this test, since we had observed in some human blood a rather high red blood cell sediment following the incubation of the blood coagulum. This volume of sedimented cells is to be added to the volume of the coagulum for the determination of the proper serum volume. Furthermore, for determining the extracorporeal volume, the coagulum and

the sediment are taken as the volume from which the hematocrit volume is subtracted, thus giving a more accurate extracorporeal volume. This correction may not be practical in all instances, however, it is necessary in all cases where a markedly increased sedimentation rate takes place.

The clot firmness was determined according to the method of Lalich and Copley (20). All clot firmness tubes were run in triplicate tests. Since tissue juice affects the coagulation time and firmness of the coagulum (20) blood was secured in a separate syringe for these tests. The same needle, placed *in situ* was used for all blood withdrawals.

The alcohol test with serum was made with a slight modification as previously described by Copley (8). Two-tenths cubic centimeter of 80 per cent ethyl alcohol was added to 0.2 cubic centimeter of native serum well mixed for incubation at 37 degrees C. The degree of gelation was recorded after 5 minutes' incubation time. The appearance of filaria was observed on a wet slide in citrated blood.

RESULTS

I Clinical observations A Splenectomy

Dog 844 and dog 814 had their spleens removed. The postoperative course of both animals was uncomplicated. Dog 814 developed a postoperative secondary anemia this however subsided on the 31st postoperative day.

B Autotransplantation of spleen

Dog 818. In this animal the spleen was removed and transplanted to the left inguinal region. The splenic artery and vein were anastomosed to the femoral artery and vein respectively.

On the first postoperative day the spleen was found enlarged and firm on palpation. It occupied the lower half of the abdominal cavity. On the second postoperative day the animal was found dead in the cage. On gross examination the organs of the thorax appeared to be normal. Gross examination of the abdomen revealed the spleen to occupy the lower portion of the peritoneal cavity. The spleen was firm and markedly enlarged. It measured 30 centimeters along its axis, 2.5 centimeters in thickness and 11.5 centimeters across its broadest points weighing 300 grams. On cut section the organ emitted blood freely in large amounts. The anastomoses of the femoral and splenic vessels were found to be patent with no evidence of thrombosis. Postmortem diagnosis splenomegaly.

Dog 846. In this animal the spleen was left attached to its usual pedicle with the exception of the

splenic vein which was anastomosed to the middle colic vein.

On the first postoperative day the spleen was palpable. The animal and the wound were in good condition. On the second postoperative day the animal was found dead in the cage. On gross examination at autopsy the left lungs were noncrepitant and infiltrated while the right lungs appeared normal. Heart and greater vessels did not show any gross pathologic changes. Examination of the abdomen revealed an enlarged spleen measuring 30.5 by 9 by 2.5 centimeters and weighing 500 grams. The anastomosis of the splenic vein and middle colic vein was found to be patent and did not show thrombi. The remaining organs of the abdomen did not show pathologic changes. Postmortem diagnosis bronchopneumonia splenomegaly.

Dog 67. In this animal the spleen was removed from its usual pedicle and transplanted to the left inguinal region. The splenic artery and splenic vein were anastomosed to the femoral artery and vein respectively.

On the first postoperative day the animal was found in shock and was given an infusion of 300 cubic centimeters of 10 per cent glucose in saline. Approximately 300 cubic centimeters of sanguineous fluid was evacuated from the abdominal cavity. The spleen was palpated and found to occupy both lower quadrants.

On the second postoperative day the animal was found dead in the cage. The thorax and abdomen were examined on autopsy. Approximately 75 cubic centimeters of serosanguineous fluid was contained in the right chest. The right lungs appeared to show infiltration indicating lobar pneumonia. The left lung appeared to be normal on gross examination. No gross pathologic changes were in the heart and greater vessels. Examination of the abdomen revealed the spleen markedly enlarged occupying the lower abdomen and displacing the other viscera. It measured 30 by 7 by 1.5 centimeters and was firm and congested. The anastomoses of the femoral and splenic vessels were patent and it appeared that they were functioning prior to death. The remaining abdominal organs did not exhibit pathologic changes. Postmortem diagnosis splenomegaly.

Dog 840. The spleen was taken from its pedicle and transplanted to the right inguinal region, the right femoral artery and vein being used as the source of blood supply. This animal survived the operation and was maintained for 31 days. An exploration was done on the 27th postoperative day at which time the spleen was found to be two-thirds its original size. The splenic vessels were palpable and pulsating indicating patency of the anastomoses.

It might be stated at this point that at the time of transplantation, directly following the anastomosis 0.2 cubic centimeter of a 1,000 adrenalin chloride was injected into the substance of the spleen to reduce enlargement and possibly any future development of splenomegaly.

C Homotransplantation of second spleen.
In two dogs, No. 845 and No. 849, a second spleen was incorporated. These spleens were transplanted to the femoral region of the recipient.

Dog 845. The spleen of dog 844 was implanted in dog 845 in the left inguinal region anastomosing the femoral vessels to the splenic vessels. This animal had a stormy postoperative course and expired on the second day after operation. At autopsy the spleen was found markedly engorged with blood and the peritoneal cavity was filled with serosanguineous liquid. Postmortem diagnosis peritonitis, splenomegaly.

Dog 849. The spleen of dog 814 was transplanted into the left inguinal region. The femoral vessels were employed to anastomose to the splenic vessels. This animal, like dog 845, had a stormy course and died suddenly on the second postoperative day. At autopsy the spleen was found to be engorged with blood and the peritoneal cavity was filled with serosanguineous fluid. It could not be determined whether the anastomoses were patent. Postmortem diagnosis Peritonitis splenomegaly.

II Hematologic findings. Tables I and II give data obtained in 16 healthy dogs. Twenty comparisons of hematologic findings are made. The red blood count varies from 6.21 to 8.47 millions. The hemoglobin varies between 12.5 to 18 grams per 100 cubic centimeters. The hematocrit ranges from 39 to 61 per cent. The erythrocyte sedimentation rate (Wintrobe) after 60 minutes was found to be zero in 10 tests, whereas the remaining ones showed variations from 2 to 21 millimeters. The coagulation time at 21 to 25 degrees C. varied from 1.5 to 6 minutes. Platelet counts ranged from 200,000 to 360,000. All tests for clot retraction showed differences between 36 and 59 per cent serum volume. The extracorporeal volume was zero in 3 tests and varied from 3 to 22 per cent in the remaining tests. The clot firmness was found in 14 tests to be between 65 and 145 millimeters mercury and in the remaining 6 tests ranged between 160 and 395 millimeters mercury. The white blood count differed from 7,000 to 16,400. This variation was found at 2 days interval in dog 845. The differential white count differed considerably. Nonsegment forms differed from 1 to 12 per cent in 19 tests and in one dog 33 per cent were found. Lymphocytes ranged from 13 to 61 per cent and monocytes were found in 13

TABLE I—TWENTY COMPARISONS OF VARIOUS HEMATOLOGIC FINDINGS OBTAINED FROM 16 HEALTHY DOGS

Dog number	Hemoglobin gm.	Hematocrit percent	Sedimentation Rate 60 min. mm.	Alcohol test 5 min. 37° C.	Coagulation time in min. (-37° C.)	Platelet count in thousand	Clot retraction		Clot firmness mm Hg	Filaria
							Serum volume per cent	Extracellular volume per cent		
85	5	5			5	30	44	4	60	
67	8	44			8	30	28	8	61	
840	16.5	54			3	30	36		83	
88	8	6			4.8	30.5	16	5	05	
840	14	54			3.5	360	43	5	80	
84	14	50			8	300	28	7	65	
825	3.5	43	5		6	5	53	4	135	
833	4.5	44			5.8	300	25		08	
846	14.5	45	2		3.5	30	46	6	140	
890	3.5	39			5	50	30	7	305	
90	16	55			5	5	43	3	75	0
44	4.5	48				20	47	5	170	
89	14.5	49			4.5	10	48	3	45	
85						3				
day	2.5	45	5		8	35	45	3	170	
9 day	3.5	45			6	5	43	3	305	
844										
day	7	50				20	56	5	20	
2. day	7.0	53				240	4	4	5	
845										
day		47			3.8	50	59		24	
2. day	2.5	48	6		4	50	58		05	
5 day	3	30	5		5	28.5	54	6	04	+

-Negative +=Present

tests amounting to 1 to 9 per cent. In 11 tests no eosinophils were counted and in 6 tests they ranged from 1 to 3 per cent and in the 3 remaining they were 13 to 16 per cent. No basophils were found in 17 tests, the 3 remaining had 1 to 3 per cent. Nine nucleated red cells were found in dog 849 which also exhibited anisocytosis, polikilocytosis, polychromatophilia, and target cells. No target cells were seen in the other dogs. Anisocytosis was found in one healthy dog and polychromatophilia in 2 dogs. The serum alcohol test was negative at 5 minute readings. *Filaria (Dirofilaria immitis)* have been observed in only one dog. In this connection it may be of interest to present the occurrence of filaria in 2 cases in another series of 24 dogs.

Table III exhibits comparative hematologic findings previous to and following splenectomy. In dog 844 these findings were from samples obtained 1 day before and prior to operation and on the 3rd and 19th postoperative days. In dog 814 a complete series of tests was run shortly before operation and up to the 31st day on 5 different postoperative days. Postoperatively dog 814 developed a secondary anemia which however on the 31st day appeared to have subsided. In this animal target cells and Howell Jolly bodies were observed following splenectomy. In dog 844 no target cells were seen and Howell Jolly bodies appeared in the control. Nucleated cells appeared only in this animal following operation. There is a trend of lymphopenia postopera-

TABLE II.—TWENTY COMPARISONS OF RED AND WHITE BLOOD CELLS OBTAINED FROM 16 HEALTHY DOGS

Dog number	Red blood cells in millions	Differential smear of red blood cells					White blood cells in thousands	Differential count of white blood cells					
		Nucleated cells	Anisocytosis	Poikilocytes	Poly chromatism	Target cells		Neutrophils	Serum cells	Lymphocytes	Monocytes	Eosinophils	Basophils
85	7.5				+		8	5	8	3			
87	8						5.4	4	35	35	3		
840	6						10.4	4	8	38			
88	8.35						9.8		8	6	4	5	
840	7		+	+	+	+		32	3	3		3	
814	6.05								3	36	3		
85	8.76						8.8		36	3			
833	8.7		+		++		8	8	45		7	36	
846	7.3						8	3	75	7			3
830	7.55						4		8	33			
40	7.40							4	6	43	8		
41	7.00							5	35	3	8		
86	7.01						3.6		20	3	7	3	
855 day	7.3						8.4		67	30			
day	8						4		65	34	9		
814 day	8.47						8		54	37			
day	8.23						10.8	3	56	3	8		
845 day	8.59						7		37	6			
3 day	8.54						7	3	44	30			
5 day	6.7						6.4	8	60	29	6		

0 = Negative + = Present ++ = Markedly increased

tively in dog 814. The platelet count does not alter and is within normal limits. The coagulation times of 100 per cent whole blood do not change significantly. The sedimentation rate is increased in dog 814 following operation and approaches its preoperative value on the 31st day. The clot retraction is present following operation in both dogs. On the 3rd and 4th postoperative days, however, there is a slight increase of the extracorporeal volume of the clot. The only abnormal finding in both dogs postoperatively is the increased clot firmness. This increased clot firmness persists for several weeks and exhibits in dog 814 a gradual decrease which, however, is still well above the preoperative values on the 31st postoperative day.

Table IV exhibits a complete series of hematologic findings in 2 dogs with autotransplantation of the spleen to the femoral artery and

vein and in 1 dog transplantation of the splenic vein to the middle colic vein. In all dogs there was a slight fall in red cell count, hemoglobin and hematocrit. Howell-Jolly bodies were seen also in the controls of dog 67 and dog 846. Target cells could be observed in dogs 840 and 846 and nucleated red cells were seen in dog 67 following spleen transplantation. The sedimentation rate is increased on the 2nd and 4th postoperative days, whereas unchanged on the 1st postoperative day. The coagulation time of 100 per cent whole blood is within normal limits. The platelet count was unchanged throughout. Clot retraction was present in all instances. In dog 67 there was an increase of the clot volume, signifying decrease in serum volume and an increase of the extracorporeal volume of the clot. In all instances there was a slight fall in lymphocytes postoperatively within the 1st and 4th

temperatures for a few hours, and more rapidly at colder temperatures. This makes it necessary to place the flask of gelatin in hot water for ten or fifteen minutes just before starting the infusion, unless the material has been previously kept in a warm cabinet. Some difficulty would be encountered in using this type of gelatin under any conditions where the environmental temperature is below 65 degrees F but in ordinary hospital practice gelation is not a troublesome problem.

Another shortcoming of gelatin is its relatively low nutritive value, it being deficient in at least four of the amino acids essential for the composition of a "complete" protein. There is evidence that gelatin may be utilized as protein in the body economy if given in conjunction with other complete proteins, but for meeting the nutritional requirements of surgical patients, gelatin is not equivalent to plasma, whole blood, or intravenous protein hydrolysates. It seems possible that this limitation of gelatin might be overcome by adding to it sufficient amounts of the amino acids in which it is deficient, but this has not yet been accomplished on a commercially practical basis.

A minor troublesome property of gelatin is its tendency to cause erythrocyte rouleaux formation ("pseudo-agglutination") with a consequent accelerating effect on the sedimentation rate. There is no evidence that intravascular rouleaux formation is of any physiological consequence, and the only re-

spect in which it becomes of importance is in the interpretation of blood grouping and cross-matching reactions of patients whose blood contains gelatin. It has been pointed out that the microscopic appearance of the rouleaux is markedly different from that of agglutinated erythrocytes, but the technician who is not trained to recognize the difference may experience difficulty in making the correct interpretation. Fortunately the production of rouleaux is inhibited in the presence of 1 per cent glycine, and a technique has been described for eliminating pseudoagglutination as a source of confusion.

The distribution and clinical use of gelatin has thus far been limited because of the availability of large quantities of surplus Red Cross plasma, and because of the recent emphasis on the need for whole blood in the replacement therapy of hemorrhagic shock and burns. However gelatin has earned a useful position as a substitute for plasma under conditions where maintenance of plasma volume is the principal requirement, and it should find important future applications in civil and military surgery particularly under conditions where plasma is not readily available. After gelatin has been used to maintain circulatory dynamics in accidental or operative trauma, or burns, any significant deficit of red cell mass should be compensated by transfusions of whole blood, just as is required with plasma itself.

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TABLE IV.—COMPARATIVE HEMATOLOGIC FINDINGS IN 2 DOGS WITH AUTOTRANSPLANTED SPLEEN AND IN 1 DOG WITH TRANSPLANTATION OF SPLENIC VEIN

Test	Autotransplantation of spleen							Transplantation of splenic vein	
	Dog 6			Dog 840				Dog 841	
	Preoperative day	Postoperative day		Preoperative day	Postoperative day			Preoperative day	Postoperative day
							30		
Red blood cells in millions	8.9		7.36	8	7.47	6.6	6.05	7.5	6.48
Hemoglobin in grams	8		14.3	6.5	12.5	5.6	5.5	14.5	5.1
Hematocrit, per cent	44	40	44	54	44	47	44	48	41
Sedimentation rate 50 mm. min.			15		15	27	9	5	
Akagel test, 5 min. 37°C.									
Coagulation time, 4°C. min.	5		6	8	8.5	3	3	5	5
Platelets in thousands	70	100	30	30	61	40	130	130	130
Clot retraction									
Clot volume, per cent	6	7	6.2	6.4	50	5	48	54	49
Extracorporeal volume, per cent	8	17	9			10	4	6	8
Clot firmness, mm. Hg.	6.5	10	> 500	8.5	> 500	170	30	140	200
White blood cells in thousands			8	10	5.8	5.4	10	13.5	11
Differential count									
Neutrophils			90		86	7	4	3	9
Segmenta	5		3	47	5	48		15	51
Lymphocytes	34		8.6	18	16	41	13	7	9
Monocytes			3			9			
Eosinophils									
Basophils								3	
Nucleated red blood cells									
Pleth-Jolly bodies	+		+		+	+	+	+	+
Microcytes									
Anisocytosis			+			++	+		++
Macrocytes									
Poikilocytes			+			++			+
Polychromasia			++		++	+	+		+
Target cells						+			+

= Negative

+ Present

++ = Markedly increased

DISCUSSION

1. *Hypersplenism.* There are numerous reports and observations on splenomegaly in the literature in connection with various diseases of different nature signifying an enlarged spleen.

Ordinarily the spleen is only increased in conditions with splenomegaly which however are not physiologic but the result of pathologic changes. In introducing a second spleen or several spleens the part of the circu-

lation to which the organ is connected may also be significant. It might well be that the normal site of the spleen in the circulatory system is of functional significance. In spleen transplantation there are considerable technical difficulties to overcome, and it is obvious that to certain parts of the circulation a spleen could not be attached.

The term "hypersplenism" has been used in the literature with various meanings, e.g. the presence of accessory spleens, "hyperactivity"

TABLE V—PLATELET COUNTS FOLLOWING SPLENECTOMY HOMOTRANSPLANTATION OF SECOND SPLEEN TRANSPLANTATION OF SPLENIC VEIN AND AUTOTRANSPLANTATION OF SPLEEN IN DOGS

Dog			Operative procedure	Platelet count in thousands			
Name	Sex	Weight, kgm.		Before operation		After operation	
				Day	Count	Day	Count
844	Male	3	Splenectomy		40	1	35
84	Male				900	9	5
							30
						3	5
						4	35
							5
					30		
					380		
843	Female	9	Homotransplantation of second spleen		385	1	70
849	Male	8			350		313
846	Female	6	Transplantation of splenic vein to middle celiac vein		70		
818	Male	6	Autotransplantation of spleen		305		90
87	Male	30			30		200
							30
850	Female	5			30	4	84
							340
						30	30

of the spleen or increased hemolytic spleen action. Nothing is known about the physiologic functions of the spleen in a 'hyperactive state. Singer, Miller and Dameshek speculated that such hyperactivity may concern the total of splenic functions or selectively' be limited to one function.

Accessory spleens are only detectable following laparotomy and careful search. It is not known whether their single or multiple occurrences amplify physiologic functions of the spleen whatever they may be. Curtis and Movitz reviewed recently the literature on accessory spleens in humans. Their own series of 178 patients represented an incidence of 31 per cent throughout various splenic disease and age groups. They made the observation that the unremoved accessory spleen may cause a recurrence of either primary thrombocytopenic purpura or congenital hemolytic icterus. Significant is their finding that persistent recovery from a recurrence after splen

ectomy was observed following the surgical removal of accessory spleens at a second operation in a case of congenital hemolytic icterus.

There is still another occurrence of multiple accessory spleens' and as many as 400 have been counted in one single patient. They were found scattered throughout the peritoneal lining and were considered as transplants resulting from traumatic rupture of the spleen and seeding of the peritoneum with splenic fragments. They often developed subsequent to splenectomy for traumatic rupture of the spleen. Buchbinder and Lipkoff reviewed the literature of this condition for which they introduced the term *splenosis*. The actual frequency of occurrence of splenosis is not known according to Curtis and Movitz. These authors stress the clinical significance of accidental production of splenosis during a splenectomy for primary splenic disease. It will have to be shown whether the experimental production of splenosis in normal nonsplenec

tomized animals would result in certain increased physiologic splenic functions.

2 *Spleen transplantation.* The transplantation of the spleen has been attempted by several investigators. The usual approach was transplantation of autogenous and homologous spleen or spleen tissue without anastomosis of the splenic artery and splenic vein to the circulation. Such autotransplantations of splenic tissue were successful with some investigators (24). The other approach of transplanting the spleen to the circulatory system has been made by Carrel (6, 7) who employed his suture method for vessel anastomosis. Carrel (7) concluded that the section of the vessels of the spleen of a dog, the section of their nerves, the suspension of their circulation for about 50 minutes and their extirpation and perfusion with Locke's solution do not modify their functions and their anatomical condition when they are replanted on the same animal. Our investigations, using the nonsuture method of Blakemore Lord and Stefkó, have been successful inasmuch as one of the 4 dogs with autotransplants survived and was observed for 31 days. The 2 dogs in which a second spleen was transplanted lived for only 2 days.

The cause of the death of the 5 spleen transplanted animals may be due either to bronchopneumonia, peritonitis or to intra-splenic hemorrhage. It is not clear whether the animals hemorrhaged most of their blood into the transplanted spleen and that they died of hemorrhagic shock. The possibility exists that the spleen tumor may have compressed the aorta, vena cava or other vital vessels or organs. All these giant spleens were signified by the presence of large quantities of blood. There can be no doubt that they originated from the influx of blood.

In one animal only splenomegaly and no other pathologic changes were observed at autopsy. At least in this animal, it appears to be certain that the cause of death was due to the enlarged spleen. Whether the hemorrhage into the spleen as such or the sequelae due to the splenomegaly were primarily responsible for the death of the animals cannot be decided. It is quite possible that these animals died of shock following hemorrhage into the spleen.

In order to eliminate splenomegaly the spleen of one animal was injected with adrenalin shortly following transplantation. This resulted in rather immediate contraction of the slightly enlarged spleen. It is of interest to note that apparently this one single adrenalin injection inhibited any future development of splenomegaly. This animal survived, and on exploratory laparotomy on the 6th postoperative day we observed a slight decrease in the size of the spleen from its original size previous to splenectomy thus corroborating the palpatory findings obtained on any of the postoperative days previously. The phenomenon of splenomegaly as found on 5 occasions following autotransplantation of the spleen in 3 dogs or following homotransplantation in 2 dogs merits further study.

Loeb recently reviewed the literature on the interaction of the "individuality differentials" of host and transplant. He designates as individuality differential a particular characteristic which is common to all the various tissues, organs, and body fluids of an individual and distinguished it from another. Loeb finds that transplantations by blood vessel anastomosis are of special interest because they make possible a separation of the effects of the body fluids on transplanted tissues from those of the host cells. Loeb summarized the observations of Carrel and of Guthrie who, in employing blood vessel anastomosis found that not only autotransplantation but also homotransplantation of kidney, thyroid, adrenal, and ovary succeeded. It may well be that homotransplantation of organs can be successful only in using vessel anastomosis instead of simple grafting.

3 *Hematologic observations.* a. *Control dogs.* It is of interest to note the wide variation of red and white blood counts and in a few cases a marked eosinophilia. The only case of filariasis in dog 845 may have affected the differential count however this cannot be stated with certainty. There is also marked variation in hemoglobin and hematocrit values. Red cell sedimentation is either present or absent.

The coagulation times are within normal range. At the time these investigations were performed, the blood saline coagulation time

test of Copley and Houlihan (11) was not developed and changes in blood coagulability of healthy dogs could therefore not be correlated to any of the other hematologic findings. Meanwhile such changes in coagulability have been shown in animals of various species (12).

The platelet count with the Copley Robb method is well within normal range as established by these workers (14). It should be emphasized that stains in proper concentration should be employed in making the count. In the original paper of Copley and Robb (13, 14) a much lower concentration of brilliant cresyl blue stain was given. This employed stain had a higher dye content and was of foreign source. Meyer (25) found that with the originally recommended concentration of 0.2 per cent dye the platelets would not take the stain. We could corroborate his observations in employing brilliant cresyl blue N.V. 27. In making a 0.5 per cent concentration of this dye we found satisfactory staining of platelets (9).

According to the method of Aggeler, Lucas, and Hamlin the extracorporeal volume in most cases showed only small values. The necessity for introducing the correction to the extracorporeal volume has been discussed in the section of methods. These corrections were insignificant in all control dogs.

The clot firmness of Lalich and Copley (20) was in the majority of instances below 180 millimeters of mercury viscometers of internal diameters of 10 millimeters in the wide portion and 3 millimeters in the narrow portion being used. Repeated tests on different days in the 3 dogs 832, 844, and 845 showed close agreement. In only 3 dogs the clot firmness in these tubes was 220 millimeters of mercury or more. This test is a measure of the hemostatic function of the blood and except in hemophilia has not yet found clinical application.

The alcohol reaction of serum was found negative in all dogs. This test belongs to the group of lability reactions and has been found not to occur in healthy humans. There is no correlation of this test to the sedimentation rate. The findings with the alcohol test in healthy dogs are the first to be reported.

The observed wide variations in data obtained with certain hematologic tests in different dogs or at times in the same animal on different days (see Table II, Dog 845) suggest that control values should preferably always be run in the same animal previous to operative procedures. This practice promises to better establish any hematologic changes brought about by surgical manipulations.

b Splenectomized dogs One splenectomized dog exhibited definitely secondary anemia. This phenomenon has been first observed in dogs by Pearce. The other dog showed only insignificant decrease in hemoglobin and hematocrit values on the 19th day. Such a trend of anemia may better have been brought about in case more determinations would have been made. Any blood loss due to the operation was minimal and could not account for the anemia which developed in dog 814. The hematopoietic activity postoperatively in dog 814 runs parallel with the hemoglobin, red blood cells, and hematocrit values and returns to approximately the preoperative values on the 31st day.

Singer, Miller, and Dameshek observed Howell-Jolly bodies as a constant finding in 19 human subjects who were splenectomized for various clinical conditions. Roth was the first to describe Howell-Jolly bodies after splenectomy in man. Red cells containing these bodies were observed by Jolly to occur normally in the blood of young mammals. We found them occasionally in adult dogs preoperatively (Tables III and IV). However, they were always present following splenectomy and spleen transplantation. Target cells were found by Singer and associates in most cases following splenectomy. We observed these cells in 1 splenectomized and 2 spleen transplanted dogs.

The claim that the platelet count is increased following splenectomy has not been substantiated after splenectomy of normal dogs. The frequent occurrence of an increased platelet count following splenectomy in certain pathologic conditions with splenomegaly in humans is frequently misinterpreted to mean that any splenectomy even in healthy animals and humans is followed by an increase in the platelet count. There have been

several investigators who claimed that thrombocytosis occurred postoperatively in various surgical conditions. A discussion of these claims is given in a recent study by Adams. We cannot enter into a discussion of the controversy pertaining to postoperative thrombocytosis because we are only concerned here with the observations of thrombocytosis following splenectomy in healthy animals.

The effect of splenectomy on the platelet count was summarized by Krumbhaar. He states that the rise in platelet count following splenectomy was found both experimentally and clinically though the evidence varies as to the duration and cause of the increase. In Krumbhaar's own experiments on dogs he found increased counts from 50 to 200 per cent higher after 3 to 12 months at the end of the observation than before operation. Immediately following the operation there was a considerable rise, but after a drop toward normal a second rise was observed which was lasting. He speculates that the postsplenectomy thrombocytosis is the result of both decreased thrombocytolysis and decreased inhibition of platelet formation. It should be noted that Loesch Witts, and Zimmermann made several studies of platelet counts before and after operation in 3 dogs. In 2 dogs they ligated the splenic veins and they splenectomized a third dog. There are marked fluctuations in their platelet counts.

In our experiences, we have found at times great fluctuations in platelet counts in healthy dogs on various days, i.e. increases up to 91 per cent, otherwise the values were usually constant over a long period of time. It is not understood to what mechanisms such fluctuations are due. One may find similar objections if one analyzes the detailed data of other workers who have made platelet counts in experimental animals or in healthy humans. Although it is not possible for us to discuss the literature on platelet counts, we wish to emphasize that platelet counts should be well controlled. In our appraisal there are few reliable methods for making platelet counts. Thus perhaps most papers giving values for them rather confuse the actual facts and do not contribute to a better understanding of the number of platelets in the circulating blood.

Wollstein and Kreidel reported platelet counts in children on whom splenectomy was performed. They found that in 3 cases of traumatic rupture of the spleen, in 20 cases of rheumatic disease, and in 4 cases of congenital, hemolytic icterus, there was no immediate increase after the operation but an increase appeared toward the middle or end of the first week. Shore and Kreidel reviewed the literature on 210 unselected surgical cases exclusive of splenectomies by 3 groups of observers. A marked rise of platelets was manifested from the sixth to the fourteenth postoperative day. However a similar rise was found in 3 traumatic cases without operation. Wollstein and Kreidel did not find any appreciable rise in the platelet count in 4 children following operations other than splenectomy.

We do not need to question the results of platelet counts so consistently obtained in certain clinical conditions in man with splenomegaly which have shown marked decreases in the count previous to operation and a return to normal limits following splenectomy. We believe platelet count increase is true only in such pathologic conditions and that the increase in platelet counts postoperatively following the removal of the spleen in healthy subjects will still have to be proved. Binet and Kaplan did splenectomies in 3 dogs. Platelet counts before and after operation were the same in one dog slightly decreased in a second dog and moderately increased in a third dog following splenectomy. Platelet counts can be very demonstrative, although they should be reliably recorded with improved methods of counting the platelets.

The occurrence of accessory spleens should be considered in studying the effect of splenectomy on the platelet count. To our knowledge, no importance has been placed on this phase of the problem. Such accessory spleens may substitute for any deficiency following the removal of the spleen. We often found in autopsies and during laparotomies accessory spleens in dogs however none was observed in our 2 splenectomized animals.

c *Spleen transplanted dogs* The comparative series of hematologic tests which were completed in 3 dogs show similar results as

obtained in dogs following splenectomy. There is a decrease in red cell count, hematocrit and hemoglobin in dogs 67 and 840. The occurrence of Howell Jolly bodies and target cells have been discussed in the preceding section. Findings on the first postoperative day in dog 846 with anastomosis of the splenic vein to the middle colic vein suggest a trend toward anemia. In all instances there is a trend of lymphopenia within 4 days postoperatively. This was also indicated in the splenectomized animals. It is of interest that the sedimentation rate does not increase before the second postoperative day, a finding which we also observed in the 2 dogs in which a second spleen was transplanted. In these homotransplanted dogs there was no change in the sedimentation rate on the first postoperative day. No tests could be made on the second postoperative day because the dogs had died.

A comparison of the platelet counts showed no significant change in any of the 6 spleen transplants. These findings are of additional interest since 3 dogs (846, 818 and 67) exhibited splenomegaly already on the first postoperative day. The presence of extremely enlarged spleens together with normal platelet counts would indicate that splenomegaly *per se* is not always associated with a decrease in the platelet count. It seems to us that possibly specific pathologic conditions in certain diseases with splenomegaly account for the decrease in the number of platelets in the circulating blood. It is possible that this decrease of circulating platelets originates with pathologic changes of the enlarged spleen.

Our 5 cases with experimentally produced splenomegaly were apparently due to hemorrhage into the spleen. It is not known yet whether these giant spleens developed so rapidly due to blockage of the venous return or other disturbances.

d. Observations on clot firmness. There are no other striking differences in the results obtained with various hematologic tests following operation with the exception of the clot firmness test. The clot firmness was increased in all instances of spleen transplantation and showed similar findings as in the 2 splenectomized dogs. This interesting observation however is not specific to severance of or injury

to the splenic vessels, but has been observed in 3 other dogs following laparotomies. Whether the animal has the ability to increase the hemostatic function of the blood following abdominal or other major operation, as indicated by these increased clot firmness values should be kept open for further investigation.

The mechanism of clot firmness is not as yet understood. There is no correlation between clot retraction and clot firmness as has been shown in model tests by Copley (10). These observations amplify the findings of Lahic and Copley (20) who found decreased or absent clot firmness with hemophilic blood. It is well known that blood coagula from hemophilic patients exhibit synecrosis. The clot firmness test may prove to be a valuable clinical aid for estimating the hemostatic function of the blood. Moreover it invites a study whether patients with certain hemorrhagic disorders would also show an increase in clot firmness following splenectomy or other operations and whether the deficiency of a certain substance or substances would account for the impaired hemostatic function of the blood. Hemostasis is not identical with blood clotting (15, 21, 27). The latter only comprises the different processes which lead to the clotting of blood *in vivo*. Arrest of hemorrhage or hemostasis depends upon other factors which reside both in the blood and the site of the traumatized tissue or the damaged blood vessels.

SUMMARY

1. Twenty series of comparative hematologic tests have been made in 16 healthy mongrel dogs. Each series consisted of red blood count and its differential smear, hemoglobin, hematocrit, total and differential white blood count, platelet count, sedimentation rate, serum alcohol, differential clot retraction, coagulation time of 100 per cent native blood, clot firmness and search for filaria. Data obtained with these series of tests are presented and discussed.

2. Eight animals were subjected to the following operative procedures: (a) splenectomy, (b) reimplantation of the animal's spleen to a different part of the circulation, and (c) implantation of a second spleen to the general circulation.

3 Two dogs were splenectomized and complete series of hematologic findings were obtained preoperatively and on different days postoperatively

4. In 3 dogs autotransplants of the spleen were made to the femoral artery and femoral vein by means of the nonsuture method with vitallium tubes. In 1 animal the splenic vein was transplanted to the middle colic vein. In 2 dogs a second spleen was transplanted to the femoral artery and femoral vein. The operative procedures are presented

5 Two dogs died with peritonitis on the second postoperative day following homotransplantations of a second spleen. Three animals with autotransplants of the spleen died on the second postoperative day. They all exhibited splenomegaly and each spleen had a weight of about 500 grams. Two animals with autotransplants had one-sided pneumonia, whereas a third animal did not exhibit any pathologic changes other than the splenomegaly. It is believed that all 3 of the dogs died of hemorrhage into the transplanted spleen.

6 One dog with autotransplantation of the spleen survived. The spleen substance of this dog was injected with adrenaline hydrochloride at the time of the completed anastomosis. No splenomegaly developed in this animal. On exploratory laparotomy on the 27th day the spleen was about two-thirds of its original size. Good pulsation of the splenic artery through out the anastomosis and good venous return of the femoral vein were found. It is not clear whether the one single injection of adrenalin was responsible to counteract the development of splenomegaly and whether its absence permitted the survival of the animal.

7 Complete series of hematologic findings are presented from 2 dogs following autotransplantation of the spleen and anastomosis of the splenic vein to the middle colic vein. The hematologic findings are similar to those which were obtained in the two splenectomized animals.

8. Clot firmness which signifies increased hemostatic function of the blood was always found increased following operation. This phenomenon was a constant finding following laparotomy in 3 other abdominal operations

in dogs, and is not considered to be in direct connection with the spleen function.

9 Platelet counts have been obtained preoperatively and postoperatively in 2 dogs with homotransplants of a second spleen, and in the 4 dogs with autotransplants of the spleen. No significant change in the platelet count was observed in the peripheral blood of these animals as also was the case in the two splenectomized dogs. It is emphasized that splenomegaly *per se* may not affect the platelet count.

10. The principle of introducing one or multiple spleens into various parts of the circulation is discussed as a method to advance our knowledge of the functions of the spleen. The direct attachment of a second spleen to the circulatory system is proposed as a method for increasing physiologically active splenic tissue.

11 Hypersplenism with regard to its various designations and the significance of accessory spleens are discussed.

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EDITORIAL

SURGERY Gynecology and Obstetrics

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NOVEMBER, 1947

THE CHEMOTHERAPY OF CANCER

AFTER long desire a beginning has been made recently in the chemical treatment of advanced cancer and in fact results of no small magnitude have been achieved since 1941. The desire to solve a problem in itself is insufficient to do it. In good science the problem must be conceived clearly and the simplest possible approach devised, bearing in mind that the greater the number of variables the greater the number of equations are required. The advances in medicine are directly related to the development of the other sciences which in our age has been stupendous.

It is now possible to see practical methods of approach to the difficult problem of disseminated cancer and the concepts seem to be easier to define than they were a decade ago. Several inhibiting agents have been found which are more or less effective in the treat-

ment of the tumors of man and animals. The advances have concerned a few specific tumors rather than cancer as a whole, and here the development resembles the history of treatment of infectious diseases: cure of infection did not evolve as such but over the years treatments were gradually devised for specific and particular infectious diseases.

Work with pure chemicals has been the most profitable: crude extracts and laboratory soups have yielded only slight dividends. Such a great number of pure compounds are available for systematic investigation that the chance of success from an erratic procedure empirically developed is too small to interest most professional investigators. In studying normal structures, one is also contributing to the foundation of the study of cancer: the systematic investigation of disease is possible only in proportion to what is known about the function of normal organs.

No doubt the greatest handicap in the development of cancer treatments has been the lack of things to measure: time is of the essence in the evaluation of putative therapeutic modifications and cancer is frequently so indolent and diffuse as to defy quick and precise measurement. Always one is faced with the fear that a little improvement may escape detection and a valuable lead thus be overlooked. The only rapid indicators of neoplastic activity now available in man concern tumors of the blood-forming organs and cancer of the prostate. In neoplasms of hemopoietic tissue the circulating cellular elements are available for quantitative study and in prostatic cancer the serum phosphatases^{1,2} provide rapid and

¹ GOTTMAN, A. B., and GOTTMAN, R. B. *J. Clin. Invest.*, 26: 7, 473.

² HODGSON, C., and HODGSON, C. V. *Cancer Res.* 1947, 7: 792.

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THE BOOK SHELF

DISCOVERY PAINS

ESTHER H. VINCENT Evanston Illinois

IN contemplating the adventures of Christopher Columbus, we experience all the delightful thrills of patriotism mystery stories and bingo. As children we bounced our balls to the rhythm of

Columbus sailed the ocean blue
In the year of fourteen ninety two |

And, as grown-ups, we find in these lines just about all we can be sure of in connection with the Admiral of the Ocean Sea. Like the discovery of anesthesia the discovery of America may be said to have a three or four way stretch. Columbus must share honors with Vikings, French fishermen, and possible other early navigators who were afflicted with secrecy. That the 1492 voyage was not Columbus's first Caribbean tour has been suspected. Doubts as to the virginity of his experience as a discoverer have arisen, but since publicity determines fame, the 1492 escapade is the one that counts.

According to the chroniclers, our hero was born anywhere from 1436 to 1451. That he was a native of Genoa is a moot point. He said he came from there and in a codicil to his will, he left a sum of money for the building and endowment of a Genoese hospital for the poor. Nevertheless, he was never known to speak or write Italian, and of the 124 Colombos living in Genoa in the fifteenth century not a single family claimed relationship with the great discoverer. He seems deliberately to have veiled his early life, and even disguised his name in a cabalistic signature of which nothing but "Christ Bearer" can be made out. So when we gaze reverently at the urchins playing about the doorway of number 37 Vico dritto del Ponticello Genoa, we cannot be too sure of visualizing little Cristoforo.

Present-day tales of Columbus trace their descent from his own notes and diaries, and from the biographies of Ferdinand and Columbus, his natural

From the Archibald Church Library Northwestern University Medical School.

son and of Bartolomé de Las Casas, first priest ordained in the New World. These records, however, are as musty and windy as the sea over which the Santa Maria sailed. The Admiral himself apparently had acquired the habit of mixing fact with wishful thinking certainties with expectations. It was not until the eighteenth century that the lamp of fame illuminated the Columbian legend. By that time it was difficult to tell the false from the true the forged from the original the fairy tales from the realities.

Columbus appeared on the scene at the time when the shadow of Islam was retreating before the rising sun of royal Spanish Christianity when the dawn of the Renaissance was beginning to dispel the gloom of the Middle Ages. Story has it that he was the son of a Genoese weaver of substantial means, that he was the eldest of a family of three sons and one daughter that he had blue gray eyes and reddish hair (early becoming gray) a hawk nose a thin, straight mouth and a tall muscular well proportioned figure. He is supposed to have attended the University of Pavia to have been trained as a weaver, and to have had some sailing experience, possibly sprinkled with dash of piracy. He may have reached England and there are rumors of Iceland. It was in Lisbon that he married Felipa Moniz Perestrelo daughter of an aristocratic Italian navigator and explorer to whose charts and nautical instrument Columbus fell heir. It was there too, that he is said to have entered into exciting scientific correspondence with cosmographer Toscanelli brilliant son of a Florentine physician.

Columbus spent about ten years in Portugal making and selling maps, studying and dreaming maps, and waving maps around in the face of John II. John was sympathetic to the waving but his Council of Geographers was not. All that Columbus had to show for his Portuguese trial was a broken hope and his son, Diego. Finally Felipa having died, the would-be discoverer too, Diego by the hand and set out for Spain. There

elegant indices of the activity of the cancer. Obviously the development of a chemical method for the study of the activity of any other cancer will be of first class importance.

At this time it is only possible to notice those chemical methods of treatment which seem to have been well established. They may be divided into 3 groups according to their action.

1 *Necrotizing agents* It has long been known that certain bacterial products when administered parenterally to creatures bearing sarcomas produce severe hemorrhage in the tumors within a few hours with subsequent necrosis of the affected area of the neoplasm. The separation of the hemorrhage producing agent in a culture of *Serratia marcescens* (*Bacillus prodigiosus*) from toxic and inert contaminants has been accomplished by Shear and co-workers in a brilliant series of investigations^{3,4}; it has been found to be a polysaccharide which is active in very small amount. Unfortunately in most cases the necrosis of the tumor is not complete and while certain tumors regress some of the tumor usually remains viable. From experiences with other agents, it is not considered necessary nor desirable that an anticancerous agent produce instant and massive necrosis to be effective.

2 *Competitive inhibition and the essential foodstuffs* It has been found in cancer of the prostate that androgen is often an essential item for the nutrition of the malignant cell; the tumors grow vigorously when androgen is administered in appropriate dosage and the cells tend to wither when the androgen supply is removed (orchiectomy) or estrogen is administered. Estrogen was the first agent of known chemical composition, aside from radioactive chemicals, which ameliorated wide

spread cancer and was the first substance known which affected cancer adversely when fed by mouth. Both estrogen and orchiectomy are in effect chemotherapeutic agents although nonspecific ones.

Heilman and Kendall⁵ found that the compound E of Kendall derived from the adrenal cortex caused massive involution of lymphosarcomas in female and young male mice. The work of Abraham White and Dougherty⁶ has demonstrated a relationship of the adrenal cortex to lymphocytes in that adrenal stimulation causes a decreased activity of lymphoid tissue. The damaging effects of 11-dehydro-17 hydroxycorticosterone on lymphoma is in line with these biochemical observations.

The theory of competitive inhibition arose from the work of Wood and Fildes wherein sulfonamides in proper concentrations were found to eliminate the effectiveness of *p*-aminobenzoic acid, a substance essential for the growth of certain bacteria.

3 *Nuclear damage* It has long been established that irradiation damages cells, and because of the frequency of induced mutations as well as much other evidence the principal effect of irradiation is believed to be on the nucleic acids of the cell nucleus. The radioactive isotopes with a short period of decay constitute a useful method of presenting soluble radioactive chemicals to the organism as a whole. Radioactive phosphorus has great value in chronic lymphatic and myelogenous leukemias⁷ and is probably the best therapeutic agent which is now available for polycythemia vera.⁸

The nitrogen mustards (β chloroethyl amines) have presented an interesting devel-

³HEILMAN, F. K., and KENDALL, E. C. *Endocrinology* 944, 341-416.

⁴DOUGHERTY, T. F. and WHITE, A. *Science*, 1943, 94, 367.

⁵LOW, BERT, B. V. A., LAWRENCE, J. H., and STOKES, R. B. *Radiology* 1943, 30, 573.

⁶KRENGEL, E. H., MOORE, C. V., BIERBAUM, O. S., and MOORE, S. *J. Lab. Clin. Med.*, 1945, 3, 107.

⁷SHEAR, M. J. and ANDERSON, H. B. *Proc. Soc. Exp. Biol.*, N. Y. 1945, 34, 3-5.

⁸HARTWELL, J. L., SHEAR, M. J. and ADAMS, JR., J. R. *J. Nat. Cancer Inst.*, 1943, 4, 107.

opment in the cancer problem. Following the demonstration of Lushbaugh that these chemicals caused a lowering of the lymphocyte count of rabbits they have been studied systematically from a biochemical standpoint.⁹ The nitrogen mustards have been used in clinical patients in the treatment of Hodgkin's disease, and it has been found that regression^{10,11} sometimes occurs after their use. The mustards are the only agents known which can produce mutations chemically,¹² an effect which hitherto has only been produced by radiant energy.

⁹GILMAN, A. and PHILLIPS, F. S. *Science*, 1946, 3, 400.

¹⁰ROADES, C. P. *J. Am. M. Ass.* 1945, 3, 656.

¹¹JACOBSON, L. O., SPILL, C. L., BARBOY, E. S. G., SMITH, T.

LOCHRAUGH, C. and DYCK, G. F. *J. Am. M. Ass.* 1946, 17, 63.

¹²ALTERBACH, C., ROSEN, J. M. and CARR, J. G. *Science*, 1947, 105, 212.

¹³HADDOW, A., and BERTON, W. A. *Nature*, 1945, 57, 300.

¹⁴PATERSON, E., HADDOW, A., THOMAS, I. A., and W. TAYLOR.

J. M. Lancet, Lond. 1946, 677.

¹⁵WARBURG, O. *Z. physiol. Chem.* 1940, 266, 305.

¹⁶HUGGINS, C., YU, E. T. and JONES, JR., R. *Science*, 1947, 106, 47.

Still another agent capable of producing regressions in cancer is ethyl carbamate (urethane) which has produced regression of transplantable carcinoma in mice¹³ as well as in human leukemia.¹⁴ Urethane has long been known to delay cell division¹⁵ without great interference with respiration, but the present interest in this substance in cancer research is due to the efforts of Haddow. It has recently been shown that urethane is able to reduce the growth of human prostatic cancer¹⁶ and notably in patients where a relapse has occurred after hormonal treatment with orchiectomy and estrogen: the drug is not antiandrogenic and so constitutes a new principle in the treatment of advanced prostatic cancer acting by pycnosis. The drug is toxic and great care must be exercised in its administration however it is another shot in the therapeutic locker.

CHARLES HUGGINS

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THE BOOK SHELF

MEDICAL ASPECTS OF THE LEWIS AND CLARK EXPEDITION (1804-1806)

O LARSELL, Portland, Oregon

THE Lewis and Clark Expedition (1804-1806) sent by President Thomas Jefferson to the Columbia River has had so important an effect on the subsequent history of the Pacific Northwest that all aspects of this epochal journey are of great interest. As leader of the Expedition President Jefferson selected Captain Meriwether Lewis (1774-1809) of the United States Infantry. Lewis was an educated man with unusual qualities of leadership and had been Jefferson's private secretary. He asked that William Clark (1770-1838) a 2nd lieutenant in the United States Artillery and a brother of George Rogers Clark the well known Indian fighter be appointed co-leader. Both men were born near Charlottesville Virginia. Clark served as equal to Lewis in command of the Expedition and the leaders are referred to as Captains Lewis and Clark. In historical records Clark was a frontiersman and soldier of much experience and contributed greatly to the success of the venture. No regular physician was provided but Lewis had sufficient medical knowledge to treat many of the ills of his company and Clark knew the simple medical practices of frontier life.

After collecting the necessary supplies and selecting a personnel of 27 men the captains placed the Expedition into winter quarters at River du Bois, near St. Louis late in 1803. Rigorous training during the winter fitted the men for the anticipated hardships of the journey. The party with 15 or 16 additional men who were to go only part of the way started up the Missouri River in three boats on May 14 1804. Its instructions were to make a geographical exploration of the country they were to traverse and to gather in

formation about its natural history and the Indian tribes.

Lewis wrote to President Jefferson on May 29 1803 as follows

"Dr. Rush has favored me with some abstract queries under the several heads of *Physical History Medicine, morals and religion of the Indians* which I have no doubt will be serviceable in directing my inquiries among that people. Drs. Barton and Wistar have each promised to contribute in like manner anything, which may suggest itself to them as being of any importance in furthering the objects of this expedition."

The physicians to whom Lewis refers were Dr. Benjamin Rush (1745-1813) Dr. Benjamin Smith Barton (1766-1815) and Dr. Caspar Wistar (1760-1818) all of Philadelphia. Dr. Rush was the outstanding American physician of that day and was professor of the institutes and theory and practice of medicine in the University of Pennsylvania. Dr. Barton² was professor of natural history and botany succeeding to Dr. Rush's chair at the death of the latter in 1813. He had become greatly interested in the Indians as a young man and was an authority on the subject. Dr. Wistar was professor of anatomy in the university and wrote the first American textbook on anatomy.

To aid in obtaining information about the Indians the following list of queries resulted as recorded by Captain Clark under the heading of "Physical History and Medicine" ³

- "What is their State of Life as to longevity?
- "at what age do both sexes usually marry?
- "How long do the Women usually suckle their Children?
- "What is the diet of their Children after they wean them?
- "Is polygamy admitted among them?

¹Original Journal of the Lewis and Clark Expedition, 1804-1806. Thwaites ed. New York. Dorland, Mead and Co. 1905. 7: 34

²McFetson, William S. Ann. N. H. Hist. 1814, 8: 477-481.

³Lewis and Clark Expedition, 7: 285.

From the University of Oregon Medical School.
Extracts from a book by the author entitled *The Doctor's*
(in press, now in press).

Clark, Charles C. Oregon Historical Quarterly 1911, 45: 2-103

What is the State of the pulse in both Sexes, Children, grown persons, and in old age, by feeling the Pulse Morning, Noon & Night &c?

What is their most general diet, manner of cooking, time and manner of eating; and how do they preserve their provisions?

What time do they usually consume in Sleep?

What are their *acute* diseases?

Is rheumatism, Plurisy or *bilious fevers* known among them? & does the latter ever terminate in a vomiting of *black matter*?

What are their chronic diseases—are palsy apoplexy, Epilepsy Madness, the gout (or Swelled Neck) and the Venereal disease known among them?

What is their mode of treating the *Smallpox* particularly?

Have they any other disease amongst them, and what are they?

What are their remedies for their different diseases?

Are artificial discharges of blood used among them?

In what manner do they generally induce evacuation?

Do they ever use Voluntary fasting?

What is the nature of their baths, and at what time of day do they generally use them?

At what age do their women begin and cease to menstruate?

In addition to preparing for his inquiries among the Indians, Lewis made provision against illness in his own party. In 1803 he estimated that the expense of the expedition would be \$2300 of which \$55 was for medicines and packing. He drew up a list of items needed as medical supplies. The items actually purchased represent some modification of the original list and are indicated in the following statement.*

Bill of Gillispy & Strong for Medicine

Israel Whelden Purveyor Bought of Gillispy & Strong the following articles for the use of M^r Lewis Esquire on his tour up the Mississippi River, & Supplied by his Order —
Viz.

1 lb. Pulv Cort Peru	\$30.00	3 lb. Bals. Traumat.	5
1/4 lb. Pulv Jalap	67	1 oz. Magnesia	20
1/4 lb. Pul Rhei (Rhubarb)	2.	4 oz. Laudanum	50
4 oz. Pul Ipecacuan	5	1 lb. Ung. diap Calamin	50
1 lb. Pul Crem Tart	67	1 lb. Ung. Epispastic	50
oz. Gum Camphor	40	1 lb. Ung. Mercuriale	25
1 lb. Gum Assafoetid	67	Emplast. Diach S.	50
1/4 lb. Gum Opil Turk opt	2.50	Set Pocket Inst. small	9-50
1/4 lb. Gum Tragacanth	37	Set Teeth Inst. small	2. 5
6 lb. Sal Glandor	60	1. Clyster Syringe.	75
1 lb. Sal Nitri 33 1/4	67	4. Penis do	
1 lb. Sal Coppperas	0	5. Best Lancets .50	40
6 oz. Sacchar Saturn opt	37	2. Trocanquet	3-50
4 oz. Calomel	75	1. oz. Patent Lint	5
oz. Tartar Emetic.	0	50. doz. Bilious Pills	
4 oz. Vitriol Alb		(Order of B. Rush	5 00
1/4 lb. Columbo Rad.		6 Tin Canisters 3.	50
1/4 lb. Eliz. Vitriol	25	3. 8 oz. G. Stop. bottles 40	20
1/4 lb. Ess. Ment. pip	50		
1/4 lb. Bals. Copulhoe	37		

*Lewis and Clark Expedition. 7 236

5. 4 oz. Tinctures do	1.85	1. Mac do.	1 20
6. 4 oz. Salt M	2.22	Portage	30
7 Walnut Chest	4.50		
			500 60

The total bill was somewhat in excess of the original estimate. While in St. Louis the Expedition was supplied by Dr Antoine Francois Sangram with additional packages of medicines, a home-made thermometer and some experimental lucifer matches. Sangram was a pioneer among the scientists of the Ohio and Mississippi valleys, with hobbies of chemistry and electricity. He so doubt attracted Meriwether Lewis, especially who was near him from December 12 1803, to May 20 1804, the party having started nearly a week before Lewis himself left St. Louis. Very likely Lewis added considerably to his own stock of medical knowledge from contact with the doctor.

At the beginning of their travel up the Missouri River the men were in fine condition. In the early part of the journey there is but little mention of medical matters, but on July 23, Clark wrote in his journal[†] that one man had a tumor on his breast, which he later opened. A week later several of the men had bad boils. Near the present site of Dakota City Nebraska, on August 14, Clark makes mention of a village of Indians which had been wiped out by smallpox 4 years earlier, stating that the huts had been burned and the wives and children had been put to death "with a view of them all going to a better country."[‡] Four days later near the present site of Sioux City Iowa, he wrote "Serjeant Floyd is taken very bad all at once with Bilious Cholick we attempt to relieve him without success as yet."[§] The patient died on the 20th "with a great deal of Composure."^{||} This was the only death suffered by the party during the entire expedition. On August 22, there is the item that the men had been troubled with stomach disorders, since leaving the Sioux River from using water of the Missouri River on which floated a scum of mineral matter from a bluff upstream. According to Clark this scum contained alum, copperas, cobalt and pyrites. Lewis took a Dose of Salts to work off the effects of tasting some of the rock from which the material came.

The fall of 1804 found the party at the site of Bismarck, North Dakota, where it prepared to winter among the Mandan Indians. Clark's journal contains a notation dated October 22, stating last night at 1 o'clock I was violently and Sud-

[†]E. S. Mearns Washington Hist. Quart. 231 27 299-311.

[‡]Lewis and Clark Expedition, 50.

[§]Lewis and Clark Expedition, 1.

^{||}Lewis and Clark Expedition, 114.

denly attacked with the Rhumetism in the neck [probably spasmodic torticollis] which was so violent I could not move. Capt. [Lewis] applied a hot Stone rapped in flannel, which gave me some temporary ease. ¹⁰ Clark suffered from this attack for several days and on the 25th he adds "R. Fields with Rhumetism in his neck, P. Crusat with the Same complaint in his Legs—the party other wise is well as to myself I feel but slight Symptoms of that disorder at this time." ¹¹

A more serious problem, however soon confronted the leaders, namely venereal infection of the men from the Mandan women. This involved diplomacy in dealing with the Indians as well as medical treatment and discipline of the men who were ordered not to touch the wife of any Indian. The orders apparently were disobeyed or unmarried squaws were available, and on January 14 (1805) Clark writes of sending Sergeant Pryor and five men, with some Indians, to hunt several men who had become infected. On the 21st he writes "One man very bad with the pox." ¹²

On November 29 1804, there is a brief note "Sergeant Pryor in taking down the mast put his Shoulder out of Place, we made four trials before we replaced it." ¹³ Cold weather also brought frost bite to several of the men and on January 26 Clark wrote "one man taken violently Bad with the Plurisie, Bleed & apply those remedies Common to that disorder." ¹⁴

On February 11 1805 Sacajawea, one of the wives of Toussaint Charbonneau an interpreter engaged by the captains at the winter camp was delivered of a fine boy. ¹⁵ Charbonneau had two other wives among the Mandans but only Sacajawea accompanied him with the Expedition when it resumed its journey. This Shoshone girl who was the only woman with the Expedition had been purchased by Charbonneau from Indians who had taken her captive from her tribe as a little girl. She played a rôle in the later history of the Expedition by gaining a friendly reception for the half-starved party when it reached her own country of the Shoshone Indians, in southwestern Montana. The boy born at Mandan was Sacajawea's first child and the labor was tedious and painful. Clark continued

Mr. Jesome informed me that he had frequently administered a small portion of the rattle of the rattle-snake, which he assured me had never failed to produce the desired effect, that of hastening the birth of the child having

the rattle of a snake by me I gave it to him and he administered two rings of it to the woman broken in small pieces with the fingers and added to a small quantity of water. Whether this medicine was truly the cause or not I shall not undertake to determine, but I was informed that she had not taken it more than ten minutes before she brought forth perhaps this remedy may be worthy of future experiments, but I must confess that I want faith as to its efficacy. ¹⁶

The last item of medical interest noted by Clark at the Mandan village bears the date of February 15. He wrote

one Chief of the Mandans returned from Capt. Lewis's Party nearly blind, this Complaint is as I am informed Common at this Season of the year and caused by the reflection of the Sun on the ice & Snow. It is cured by gently sweeting the part affected, by throwing Snow on a hot Stone. ¹⁷

The journey up the Missouri was resumed on April 7 1805 but little of medical interest is recorded. On May 14 while on the Yellowstone River one of the boats which contained the medical supplies was swamped. ¹⁸ Much of the material was damaged and some was destroyed. Between Maria's River and the Great Falls of the Missouri, on June 10 Sacajawea fell ill. Clark wrote "I bleed her." ¹⁹ Four days later Clark noted

"the Indian woman complaining all night & excessively bad this morning. her case is somewhat dangerous. two Men with the Toothache, 3 with Tumors & one man with a Tumor & a slight fever." ²⁰

On June 16 Lewis wrote in his journal concerning Sacajawea, who had not yet recovered that two doses of barks and opium had slowed and strengthened her pulse and made it more regular. He had found it almost imperceptible, or very fast and irregular when it could be felt. There also was twitching of the fingers and of the leaders of the arm. In addition to barks and opium, Clark prescribed mineral water for her. The pulse improved the twitching was reduced and a gentle perspiration came on, with much relief from pain. The woman complained chiefly of distress in the lower abdomen, Clark ascribing it to an obstruction of the menses in consequence of taking cold. ²¹ He continued treatment with barks and iandandum.

The party reached Sacajawea's people in the middle of the summer of 1805 its food supplies exhausted, and in serious straits because of this and the scarcity of game. The Shoshone chief proved to be Sacajawea's brother and a touching story of

¹⁰Lewis and Clark Expedition, 1 30

¹¹Lewis and Clark Expedition, 1 306

¹²Lewis and Clark Expedition, 1 30

¹³Lewis and Clark Expedition, 1 30

¹⁴Lewis and Clark Expedition, 1 3

¹⁵Lewis and Clark Expedition, 1 37

¹⁶Lewis and Clark Expedition, 1 36

¹⁷Lewis and Clark Expedition, 1 37

¹⁸Lewis and Clark Expedition, 1 36

¹⁹Lewis and Clark Expedition, 1 36

²⁰Lewis and Clark Expedition, 1 36

²¹Lewis and Clark Expedition, 1 36

¹⁰Lewis and Clark Expedition, 1 358.

¹¹Lewis and Clark Expedition, 1 36

¹²Lewis and Clark Expedition, 1 37

¹³Lewis and Clark Expedition, 1 41

¹⁴Lewis and Clark Expedition, 1 39.

¹⁵Lewis and Clark Expedition, 1 36.

¹⁶Lewis and Clark Expedition, 1 36.

¹⁷Lewis and Clark Expedition, 1 36.

¹⁸Lewis and Clark Expedition, 1 36.

¹⁹Lewis and Clark Expedition, 1 36.

²⁰Lewis and Clark Expedition, 1 36.

the reunion is related. The half-starved explorers were supplied with the provisions enough to meet their immediate needs from the Shoshone's own meager store, and the expedition, which had found itself in an almost desperate situation, was enabled to continue its journey.

The party pushed westward through the Rocky Mountains in September. Food was scarce, due to the lack of game, which was limited to a few pheasants and squirrels. Fish and roots formed a large part of the diet. The going became more and more difficult and the men became weak and debilitated, many suffering from dysentery and skin eruptions. Finally they were obliged to kill a goat for food.

On September 21 Clark wrote "I am very sick today and puke which relive me."²² On the 24th he continued "Capt. Lewis sick all Complain of a Lax & heaviness at the stomach. I gave rushes Pills to several, eight or more of the men also being ill. On the following day he wrote that Lewis was very sick, and most of the party was complaining. He gave them salts and tartar emetic. He added, "Several men So unwell that they were compelled to be on the Side of the road for Some time, others obliged to be put on horses. I gave rushes Pills to the Sick this evening."²³ Several deer were killed on September 30 and the condition of the men immediately improved with better food. However in a few days the party was obliged to return to dried salmon and roots, with renewed gastrointestinal disorders. Not until they reached the Columbia, near the junction of the Snake River on October 16 were they able to obtain fresh meat, in the form of "some nice fat dogs" which they purchased from the Indians. Everyone's health immediately improved. One of the leaders notes that he came to like the meat of "nice fat puppies."

While in western Montana, Lewis wrote that he tried to learn if the Shoshones had venereal disease among them, and to find out their remedies. Through the interpreter and his wife he was informed that sometimes they were affected, but he was unable to learn of any remedy they employed. "They most usually died of its effects." The captain thought that, because of the isolation of this tribe, both gonorrhea and syphilis must be native to America although he recognized that smallpox, from which the Shoshones as well as most of the other tribes had suffered severely was an imported disease. He also made some observations regarding standards of sexual morality stating that "some of their women appear to be held more

sacred than in any nation we have seen. How ever this was but comparative, and control appeared to be entirely in the hands of the husband, who for a suitable reward would barter his wife for a night or longer."

With reference to childbirth among the natives, Lewis comments on the ease of delivery when the father was an Indian. He notes that when one of the Shoshone Indian women who had been helping the party transport its baggage had halted at a little stream, he inquired of the chief as to the reason. The latter informed him that the woman had stopped to deliver her fourth child and would soon overtake the party. This she did in about an hour with her newborn babe, apparently as well as ever.

Clark wrote on October 17 1805, of the numerous cases of sore eyes which he encountered among the natives, not only in the region of Kennewick, Washington, where the party then was, but among the Flatheads on the Kootenoke and Lewis Rivers which they had left some time earlier. Many of the Indians were blind in one or both eyes. Many of the natives also had lost their teeth at middle age, and in others the teeth were worn to the gums, especially in the upper jaw. He ascribed the bad teeth, in part, to the habit among the Indians of eating the "rins & scales" of the dried salmon, which constituted a large item of their diet, along with the flesh, and to sand attached to the edible roots which supplemented the salmon.²⁴

On November 15, 1805 the Expedition arrived at the mouth of the Columbia River after traveling 4134 miles, according to Lewis's estimate.²⁵ Alexander MacKenzie had reached the western ocean through Canada in 1793 but Lewis and Clark were the first explorers to reach the Pacific by crossing the continent between the Canadian boundary and Mexico. Valuable observations and collections had been made and Indian tribes never before seen by the white man had been encountered. After crossing to the south side of the river they built winter quarters at Fort Clatsop, south of the present city of Astoria. The party reached the mouth of the Columbia at the worst part of the rainy season and was faced with a good deal of discomfort until quarters could be completed. Dated December 11 we find this entry: "rained all last night moderately. We are all employed putting up huts or Cabins for our winter quarters."²⁶ Several of the men were beginning to suf-

²²Lewis and Clark Expedition, 3 88.

²³Lewis and Clark Expedition, 3 86, 87 22.

²⁴Lewis and Clark Expedition, 3 86.

²⁵Elliott Coates, ed. History of Lewis and Clark Expedition (3rd), 6 74.

²⁶Lewis and Clark Expedition, Thwaites ed., 1 277

fer from the excessive dampness four of them had violent colds, one had dysentery a third had tumors on his legs, and two had been injured by dislocations and strains

Here again the problem of food obtruded itself. The Indians, who had learned to barter with the Boston ships and other fur traders, demanded high prices for everything they sold. On December 3 an elk was brought in, providing a much needed change of diet. Seven more elk were killed shortly afterward but because of unusually warm weather much of the meat spoiled and the party had to resort to pounded fish again, resulting in the usual dysentery and weakness. On December 30 four more elk were shot but the animals became scarcer as colder weather came on so that dog meat blubber from a stranded whale, roots and berries served as food for a time. The captains remark that the men had acquired a taste for the flesh of dogs and that while living on it they were in better condition and health than at any time since leaving the buffalo country. In the early spring the annual run of the smelt or culachon into the rivers from the ocean brought a welcome change of diet in great abundance. From this time on the food supply appears to have been adequate both for the short remaining time at Fort Clatsop and on the journey eastward. A salt cairn for the purpose of obtaining salt from sea water had been built by the party at the site of the present town of Seaside Oregon some miles from Fort Clatsop.

There is also complaint about the incessant rain and the innumerable fleas. The Indians and their lodges abounded with these vermin which could not be kept out of the crowded quarters of the party. Other discomforts are mentioned by Clark as follows. Sergeant Pryor unwell from dislocation of the shoulder. Gibson with the dysentery. Jo Fields with bites on his legs and Werner with a strained knee.

The sexual standards of the women of the Chinook tribe were unusually lax and venereal disease already introduced by sailors of the fur trading ships, is frequently mentioned. While on a short journey on November 18 Clark encountered some Chinook Indians and noted that he saw four women and some children covered with sores, scabs and ulcers, which he regarded as due to venereal disease. The Clatsop Indians also were commented on. The young women, many of whom were handsome, sought the men of the exploring party apparently with the approbation of their friends and relatives. To save the party's supply of knives and other more valuable articles, the captains divided some ribbon among the men of

the party 'to bestow on their favorite lassies.' Several of the men soon became infected with venereal disease. They were treated with mercury some to the point of salivation.

Although Lewis and Clark found venereal disease very prevalent among the Chinooks and Clatsops who inhabited the region about the mouth of the Columbia River, the early explorers and fur traders make no mention of it or of other diseases among the Oregon Indians, save small pox. Robert Gray in 1792, does not mention it, and Captain Bishop of the ship Ruby who spent some time among the Chinooks in 1795 and described the natives in detail, does not refer to syphilis. Yet 10 years later it was widespread and by 1814 had reached epidemic proportions among the fur traders from their contact with native women. Undoubtedly syphilis and its companion gonorrhea, were introduced by the crews of the fur trading ships that came in increasing numbers. Spread of these diseases was facilitated among the Clatsops and Chinooks, especially by the low sexual standards of these tribes on which comment was made by virtually all of the earlier writers.

Regarding the Indians, Lewis stated that once contracted by them venereal disease continued during life, always ending in decrepitude, death or premature old age although as he thought, from the use of certain plants, together with their diet they did not suffer great inconvenience. He regarded this as especially true among the Chippewa Indians, farther east who used a decoction of lobelia and of a species of sumac. These decoctions were drunk in liberal quantities and were regarded by Lewis as effective both in syphilis and gonorrhea.

Under date of February 7 1806 Lewis wrote that the smallpox had carried off a large number of natives near the mouth of the Columbia. The disease had prevailed 4 or 5 years earlier among the Clatsops and destroyed several hundreds of them. He regarded this epidemic as accounting for the deserted villages along the coast toward the Tillamook district.

During the stay of the party at Fort Clatsop the Indians frequently brought their sick to the captains for treatment. Many of the natives benefited from the medicines administered. One young Clatsop chief cured of some ailment, brought his sister to Captain Lewis as a reward. The captain refused her much to the chagrin of the chief as well as of the damsel, who after remaining about the door of Lewis's quarters for some time departed as had the brother earlier.

The party began its homeward journey on March 23 1806. It explored the Willamette River

as far as the present site of Portland, and continued eastward along the south bank of the Columbia. The large number of eye ailments among the Indians again impressed the leaders. Clark wrote on April 8 when the party was between the Sandy River and The Dalles, concerning an Indian woman who was blind in one eye, and of a man nearly blind in both eyes. He stated that blindness appeared to be more common among the natives of the Columbia than among any other people he had ever observed, and that they almost invariably had sore eyes at all ages, with the loss of one eye very common and complete blindness almost invariable in old age. Clark, like others who commented on this affliction among the Columbia River Indians, was inclined to ascribe it to the reflection of the sun on the water to which the Indians were constantly exposed while fishing and to the fine sands carried by the wind. It is now known that trachoma was very prevalent among many Indian tribes. This disease no doubt caused the eye conditions which the explorers commented upon.

The contact with the white men the previous fall had evidently given the Indians along the Columbia a great deal of confidence in the medical ability of the captains. On April 28 between The Dalles and Walla Walla, Clark stated in his journal that several sick persons were brought to the captains for medical aid. One had a knee contracted by rheumatism, another had a broken arm etc. All were treated, much to their gratification. They were given some eye water which Clark thought would be of more help to them than any other article the party could offer them.

They continued their search for answers to the questions concerning medical matters among the Indians. Lewis wrote on April 30 of trading one of their poorest horses for a very good one with a Chopunnish Indian. He commented on the practice of segregation of menstruating women from the remainder of the family. The daughter of this Indian having arrived at the age of puberty was obliged to sleep at a distance from her father's camp and when travelling to follow at some distance behind. At other camps of this Chopunnish tribe he observed a small lodge with one fire which served as a retreat for the women during menstruation. The men were permitted to approach no nearer than fifty to sixty paces from this lodge and if they desired to convey anything to the occupants they would throw it toward the hut as far as they could and retire.

Clark wrote on May 5 of giving a native some volatile liniment to rub on his knee and thigh for pain. The Indian soon recovered and "has never

ceased to extol the virtue of our medicine. The previous fall, near the Kookoonke River an Indian had been encountered who could not walk because of a tumor on his thigh. Clark wrote on the return trip that he gave him a gentle purge, deaned and dressed his sore and left him some castile soap to wash the sore, which soon got well. This man also credited the captain with curing him, the two cures having given the natives an exalted opinion of Clark's skill as a physician. They came to him in considerable numbers for relief from various ills. The captains considered it pardonable to continue this deception," namely that they were skilled healers, for the Indians would not furnish any provisions without compensation in merchandise and the party's stock of goods by now was greatly reduced. Clark added that he and Lewis took care to give the Indians nothing which could possibly injure them, and that many times medical and surgical relief was afforded in simple cases."

Lewis noted that scrofula, ulcers, rheumatism, sore eyes and the loss of use of their limbs were the most common types of ailments among the Indians of the Columbia. Regarding paralysis of the extremities he wrote that he had seen three instances among the Chopunnish. A chief of considerable note had been afflicted with it for 3 years, being incapable of moving a single limb and lying like a corpse in whatever position he was placed. Yet he ate heartily, assimilated his food, and was in a good state of nutrition. His pulse was good and he understood what went on about him. Lewis thought that the natives' diet of roots and other plants was in part responsible for some of their ailments.

While the party was on the upper Kookoonke River (in Idaho) Clark wrote on May 24 that one of his men (Bratton) was very low, eating heartily but being so weak in the small of his back as to be unable to walk, although every remedy had been employed. One of the men stated that he had seen similar cases restored to health by violent sweats, so at the request of the patient this treatment was undertaken. A hot fire was made in a hole four feet deep and three feet in diameter dug for the purpose. After burning long enough to thoroughly heat the ground, the fire was withdrawn a seat was placed in the hole, the patient being placed thereon, with a board under his feet for protection. The hole was covered with blankets, supported by hoops, and a receptacle of water was handed the patient, with instructions to throw the water on the bottom and sides of the hole. After about twenty minutes in the steam-bath thus produced the patient was removed and

placed into cold water for a few minutes. He then was returned to the hole for about an hour removed again and covered with blankets which were removed one by one until the man cooled off. The account concludes. This remedy took place yesterday and Bratton is walking about today and is much better than he has been.

The Indians requested that the same treatment be applied to the paralyzed chief previously mentioned. The latter was so disabled that he could not sit up at the first attempt but by arranging a system of thongs and guy ropes to support him a second attempt was successful. He suffered some shock, and was given twenty drops of laudanum. The following day he could use his hands and arms. After several repetitions of the treatment he became able to use his legs and felt perfectly well. There is little in the description of either of these cases or their treatment to aid in diagnosis. Since the sweat bath treatment was widely used by the Indians themselves in all parts of the continent it could hardly have been new to this tribe in the Rockies, but perhaps the white man's modification of it and the results they had seen on Bratton caused them to have it tried on the chief.

On reaching the Bitter Root Mountains the party divided into two groups for further exploration and to recover supplies and canoes cached at different points on the westward journey. It was reunited on August 12, 1806, near the junction of the Yellowstone and Missouri Rivers, according to plan. Just before the two groups were joined Captain Lewis was accidentally shot in the leg while hunting and for a time was seriously ill.

Captain Clark was obliged to assume responsibility for the rest of the journey which was resumed on August 17, the party proceeding down the Missouri River. Five days after he was injured Lewis recovered sufficiently to be able to walk for the first time.

After crossing the continental divide and leaving the Oregon Country on the eastward journey the medical notes, as well as notes on other matters, are scanty. The effects of contact with the Luetse, Mandan, Chinook and Clatsop women remained with some of the men who were taken to the Great Falls of the Missouri for rest and treatment with mercury. This item and the wound received by Lewis constitute the chief entrees of medical interest. The party visited a few days with the Mandan Indians with whom it had spent the winter of 1804-05 and then continued the journey down the Missouri reaching St. Louis on September 23, 1806.

The epochal journey planned by the far-seeing Jefferson, and so important in establishing the claims of the United States to the Great West was brought to a successful conclusion with the loss by death of only one man. Judging from the simple narrative of the journals, the party faced a number of serious medical problems. Thanks to the hardiness of the men and the healthy life of the trail, supplemented by such stock of medical knowledge as the captains possessed, there is no indication of permanent disability save of course the effects of venereal disease which must have remained with many of the men in spite of the drastic treatment employed.

REVIEWS OF NEW BOOKS

A CLEAR and concise presentation of facts is made in *Fundamentals of Clinical Neurology*¹ by Merritt, Mettler and Putnam which will aid the student and the physician interested in neurology and its applications in the diagnosis of organic disturbances of the central nervous system.

A small and compact section deals with the examination of the nervous system in a rather rapid and cursive way. The intention of the authors was to expose a practical technique for examination of the patient from which all special and finer procedures have been omitted. However a small chapter on the examination of a comatose patient seem to be too brief and may leave the examiner rather helpless.

The second portion of the book deals with the anatomic diagnosis of peripheral as well as central nervous system lesions. This is the most important portion and is beautifully presented with a large number of good anatomical as well as schematic illustrations and photographs. In this presentation great emphasis is put on the structure of the various portions of the central nervous system and especially on their arterial blood supply and their venous drainage which is so commonly neglected in other books on clinical neurology and one remains conscious through out the text of the cerebral and spinal cord blood circulation and its connections with the rest of the blood vascular system. Anatomic structure, blood supply and function are closely associated and the disorders arising from disturbances in this association are briefly but clearly mentioned and discussed. The chapters on spinal cord syndromes, spinal cord transections, diseases of the cerebellum, tumors of the brain, and vascular lesions of the brain are brief and give a rather incomplete picture of the symptomatology and the pathology associated with these lesions. The section on the anatomic diagnosis includes a chapter on peripheral nerve, dorsal root ganglion and ventral column cells on the spinal cord, on the infratentorial brain stem, on the cerebellum, on the thalamus and corpus striatum, and on the cerebral cortex. The last chapter deals with the cerebral spinal fluid its circulation function, and composition, the methods of examination, indications and contraindications for lumbar puncture, measurement of pressure and testing of dynamics and also gives an excellent presentation of the pathologic changes seen in the spinal fluid and their diagnostic value. It gives a clear and complete summary of changes occurring in the spinal fluid in various types of cerebral and spinal cord lesions including trauma, meningeal infections, abscesses, bacterial infections, tropical diseases, hemorrhages, tumors, intoxications, and generalized diseases originating in other organs and involving the cerebrospinal fluid pathways.

This is a short and excellent book which should be read by all medical students and kept on the desk of most physicians.

GEORGE FRERK.

THE author's purpose, as stated in the preface of *Color Atlas of Hematology*², is to furnish a color atlas of hematology for medical students, laboratory workers, and general practitioners of medicine. The author has accomplished in a small book of 201 pages which is easily handled. In addition to the excellent color pictures and a brief description of each normal and pathologic cell type there is also a brief discussion of the hematologic features of various blood diseases with the typical blood picture of each disease. There are short chapters on blood parasites, the Rh factor and bone marrow.

This book is not just an atlas. It also contains chapters on the more important hematologic techniques, on the normal standards of human blood, and on the blood picture of various laboratory animals. A unique aspect is the beginning chapter on definitions of hematologic terms and the last chapter on hematologic findings in various diseases and conditions arranged in alphabetic form.

Although the material in this book is, for the most part, taken from the author's larger work *Diseases of the Blood*, it is a concise and excellent atlas of hematology. It will be useful to technicians and medical students in the laboratory and to clinicians in the diagnosis of blood diseases.

GEORGE FRERK.

IN the volume *Curare: its History, Nature and Clinical Use*³ the author presents an exhaustive and critical review of the surprisingly extensive literature on curare. As the author states it, "This book attempts to bring together the stories of the early explorers—the accounts of the botanists, whose search for the many and elusive plants used in the fabrication of curare is by no means concluded; the early investigations of the poisons on animals; the chemical examination of curares, which during the last ten years has progressed rapidly; and modern physiological and pharmacological research, culminating in the present extensive clinical use of the drug." The book is well written, the references are complete, and there is a full index. Physiologists, pharmacologists, and clinicians are greatly indebted to the industry and effort of the author for this source book of information and nonscientific laymen will find a wealth of interesting and instructive material in it. The book is timely in view of the renaissance of interest in the therapeutic uses of curare. With respect to this the author's comments merit quotation. "With the pioneer work of Griffith and the investigations of Cohen

¹Color Atlas of Hematology, with Brief Clinical Description of Various Diseases. By Roy E. Kruck, M.D. Philadelphia, London, Montreal: J. B. Lippincott Co. 1947.

²Curare, its History, Nature, and Use. By A. R. McIlwain, Ph.D. M.D. Chicago: The University of Chicago Press, 1945.

³Fundamentals of Clinical Neurology. By H. Hoobler Merritt, M.D., Fred A. Mettler, M.D., Ph.D., and Tracy Jackson Putnam, M.D. Philadelphia and Toronto: The Blakiston Co. 1947.

finding both Ferdinand and Isabella apathetic alike to his eloquence and to his maps, Columbus found solace in the arms of Beatriz Enriquez de Harana, mother of his second son, Fernando. For the next eight years their Catholic Majesties kept poor Columbus dangling. A drop by drop account of the trickle of hopes and coins that fell into his begging-cup would discourage a Job. But the patience of Columbus was sustained by his fixed idea. At last, deciding that he was a displaced person in Spain, he started out to invade France. Every school-child knows the rest of the story—the romantic halt at La Rabida, the recall to Granada, the last rejection, the second recall near the bridge called Pinos, the episode of the Queen's jewels (she didn't really have to pawn them!) and the final agreement.

On August 3, 1492, three little ships sailed out from Palos with eighty-eight jittery mariners, ruff raff drummed up from the taverns of the town. The leaders, however, were experienced sea men, the brothers Pinzon (Martin and Francisco on the Pinta, Vicente on the Nina). On March 15, 1493 two of the little ships came back to Palos, bringing gold, curios, Indians and probably syphilis. On the shores of a strange new world they had left the sea-wrecked Santa Maria and a sorry group of impromptu colonizers, who ruined both themselves and the natives. Columbus thought America was Asia and never discovered his mistake. The Indians thought the white men were gods, but soon discovered their mistake. Las Casas, dying at 92 in Madrid, left to posterity his *Historia de las Indias*, so horrifying a manuscript that Spain kept it unpublished until nearly the end of the nineteenth century. Oviedo who as a boy saw the suppliant Columbus at Granada, spent some time on Haiti as a gold supervisor and in his *Lo General y Natural Historia de las Indias* mixed bloody and revolting tales of debauchery with his descriptions of tobacco and guano.

Physical ills bothered Columbus little up to the time of his first American journey although the strain of living on frustrated hopes must have been considerable. Probably the driving force of his fixed idea kept his body in tune with his ruling passion. However on Voyage I he complains of "sore eyes, a discomfort that evidently pestered the rest of his life. It has been suggested that it may have been trachoma. Voyage

"Gold Rush" of '93, started on September 24, and was full of misery. Two days out Columbus fell victim to a strange malady. It cast him into a dangerous disease between a pestilential fever and lethargy which deprived him of sense and memory. He was in a stupor at times, and

thought himself at the point of death. This may have been typhus or typhoid or even brucellosis, but it could have been due to febrile attacks of secondary syphilis, clinically more severe in those days than now. In a couple of weeks he felt better but had recurrent attacks over a period of some months. Dr. Garcia Fernandez, ship surgeon on the first voyage, reports jail fever among the crew later supplanted by "tropic fever." But Dr. Alvarez Chanca, physician on the second voyage, reports that at times one third of the men were suffering from some unknown disease called "the scourge." It was during the period between these two voyages that syphilis first became rampant in Europe.

Primary proof of the American origin of syphilis is said to be a treatise against the "serpentine disease" (*Tractado Contra el Mal Serpentina*, Sevilla, 1539) by the Spanish surgeon, Ruiz Diaz de Isla. This author saw the first syphilitics who landed in Europe, and treated them by rubbing their sores with mercurial ointment and by administering guano, the Holy Wood that grew in America and was said to be used by the Indians as an antidote to what ailed them. A phrase found in the original manuscript (1537) is omitted from the printed editions. It reads: "As it is of its very nature contagious, they got it easily and presently it was seen in the fleet itself in a pilot of Palos who was called Pinzon and others whom the aforesaid malady kept attacking."

Now Martin Alonso Pinzon, captain of the Pinta, had gone A W O L on the first return voyage and had stopped in Bayona in Galicia before rejoining Columbus at Palos. The hygienist, Tommaso Ragion di Ravenna, states that the first epidemic of syphilis began in Galicia in March of 1493, and that the disease was then called *Morbus Galecum*. Ragion wrote a treatise under that title which he published in Venice in 1537. Since Francisco Pinzon was heard of no more after Voyage I, he is too shadowy a figure to consider. And since Vicente Pinzon kept on being a healthy explorer for many years, he probably did not contract the disease. But Martin Pinzon is said to have died shortly after his return from America, and most probably it is Martin to whom Diaz de Isla refers as the "pilot of Palos who was called Pinzon."

Both Las Casas and Oviedo agree that syphilis originated in America, but Diaz de Isla maintains that his serpentine disease is identical with the "lichen of the Greeks and the kiss-spread mentagra" of Pliny. He further states that the therapeutic action of mercury was unknown during the first fifteen years of syphilis, but later admits that

in anesthesia, curare became fully established as an important and useful adjuvant and today the drug appears to be entering upon a period of trial in a wide variety of conditions. This phase is nearly always encountered with therapeutic agents, that is after emerging from a period of neglect they pass through a period of overuse and then the period of overenthusiasm is often followed by a period of reaction and disappointment. Hence it may be some years before the field of true usefulness of curare is finally evaluated. There will be less disappointment if those who plan to try curare for any purpose consult this authoritative volume.

CARL A. DRAGSTEDT

THE account of the isolation and application of folic acid to the macrocytic anemias presented by Dr. Spies in *Experiences with Folic Acid*¹ is a brief and readable corollary to the volume published last year on the biological aspects of the blood dyscrasias. As the author points out in his introduction this important medical discovery was the result of work carried on in many different laboratories. Intimately associated as he has been from the biochemical as well as the clinical viewpoint Dr. Spies is admirably qualified to integrate and summarize the steps which have been accomplished toward an understanding of the pathogenesis and treatment of pernicious anemia and the related anemias.

The introduction is a simple but complete account of the breaking down of potent liver extract and the assay of its chemical constituents. It is followed by a chapter on selection of subjects and methods of study which provides not only a fascinating account of experience with folic acid but a notable example of large scale clinical research excellently directed.

The studies were carried on in centers in Cincinnati, Birmingham, Havana, and San Juan, Puerto Rico. The criteria for the selection of patients were carefully defined and were adopted in all hospitals involved in the study and the rules for management were rigidly adhered to. The response to folic acid is discussed on the basis of 78 cases of Addisonian pernicious anemia, 76 of tropical sprue, 2 of nontropical sprue, 46 of nutritional macrocytic anemia, 3 of macrocytic anemia of pregnancy, 8 of nutritional leucopenia, and 5 of cirrhosis of the liver. Hemopoietic response was satisfactory in all cases except several of the cirrhotic group.

A pure synthetic substance has thus been found which causes regression of the symptom-complex associated with the macrocytic anemias and remission of the blood picture. There is slight evidence that it will prevent neural disturbances in pernicious anemia.

EDITH B. FARMERWORTH

THE four hundred and thirty page book *Diagnostic neuro-surgical* by Guillaume and Sigwald² is to our knowledge the first book on neurosurgical diagnosis published in France and written by two French

¹EXPERIENCES WITH FOLIC ACID. By Tom D. Spies, M.D. Chicago: The Year Book Publishers, 1947.

²DIAGNOSTIQUE NEURO-CHIRURGICALE. By Jean Guillaume and Jean Sigwald. Paris: Presses Universitaires de France, 1947.

neurosurgeons. Throughout its 430 pages its authors stress the necessity of making an early diagnosis in order to perform an early operation before irreversible damage and changes have taken place in the cerebrum. Their main objective is to familiarize the practitioner with the diagnosis of neurological conditions which can be helped by surgery. They make him conscious that not only intracranial tumors need early operation, but that other neurologic diseases may benefit greatly from surgical intervention diseases such as types of epileptiform seizures hydrocephalus, acute cerebral hemorrhage and certain neuralgias involving cranial and other nerves.

The first part of this book deals with the surgical anatomy physiology and pathology of the brain and a short anatomical and histological study is made of the various intracranial tumors. The reaction of the brain to neoplasms and increased intracranial pressure is also presented. The second part deals with the symptomatology of the neurosurgical lesions of the brain and includes chapters on the generalized symptoms and the local symptoms produced by tumors and their effect on the various cerebral functions. Examination of the patient and the more important diagnostic procedures are briefly mentioned.

In the third part of the book, which is the most important the authors study the clinical pictures produced by space occupying lesions in relation to their location and the nature of the lesion and discuss the diagnosis and the possible abnormalities found in radiographies, encephalographies or ventriculographies of that region. A short chapter is devoted to the anatomical and clinical study of craniocerebral injuries and their complications and sequelae. Three chapters deal with the spinal cord and the peripheral nerve root. The anatomy and physiology of the spinal cord is briefly reviewed, mostly from a surgical point of view and the syndrome produced by various types of lesions in relation to their location are explained in a short and concise presentation. The symptomatology, etiology the clinical form and the various diagnostic problems of spinal cord compression are discussed with more detail. The last two chapters are dedicated to the study of nerve root compression and spinal cord injuries.

Operative techniques and methods are not discussed and are hardly mentioned but the danger of spinal puncture in cerebral tumors with increased intracranial pressure and in acute craniocerebral injuries is emphasized. The authors follow very strict indications for the performance of diagnostic procedures such as spinal punctures, air studies or myelographies. Most of the illustrations are schematic drawings the pictures are few but they are well chosen and expressive.

GEORGE PEREZ

THE aim of the book to set out concisely the principles of operative surgery with adequate detail has been admirably done in *Eye Surgery*³ by H. B.

³EYE SURGERY. By H. B. Stallard, M.B.E., M.D. (Cambridge), F.R.C.S. (Ed.). Baltimore: A. Williams Wood Book Co., The Williams & Wilkins Co., 1946. Printed in Great Britain by John Wright & Sons Ltd., Bechole.

Stallard. The book was written at sea, in military transports, and in camps amidst distractions and without access to the ophthalmic literature, which in places gives it an urgency and personal appeal that makes it less dogmatic than the usual textbook on surgery.

The repetition as to anesthesia and the instruments make the book appear as though each subject was prepared for a new group of associates.

One misses the frequent references to the names in the literature of the history and development of each operation but each subject is taken up in the practical application of details under the harassing circumstances of war.

The introductory chapter discusses the operating room layout, staff discipline care and maintenance medication, anesthesia, sterilization, general post operative treatment, and dressings.

Much space is given for the general principles of plastic surgery and the operative technique for reconstruction of the lids after war injuries, and there is discussion of civil and military accidents.

The surgical anatomy is given in detail of each subject presented and the possible complications emphasized in regard to the major and minor surgical procedures.

The use of diathermy and kathermy in the treatment of hemangiomas of the retinae as well as of retinal separation is given and the application of radon seeds for the treatment of glioma retinae and for malignant melanoma of the choroid. Illustrations are concise as are the details for the excision of a tumor of the choroid.

The author's results in statistical form with the operative procedures are included in the care of retinal separation hemangiomas of the retinae and of the use of radon seeds in malignancy.

It is an excellent book on surgery which is small enough that it can be easily carried about for quick reference and also gives the details for the eye surgeon who does not operate frequently.

BRULAN CUREMAN.

It is now twenty two years since Professor Boyd first wrote his *Surgical Pathology* and during that time he has published six editions. The sixth edition, which is now at hand, affords ample evidence for the long popularity of the book. Designed not for the professional pathologist, but rather for the practicing surgeon and the student who is preparing himself to take the examinations of the American Board of Surgery this book is readable, comprehensive, and modern. Professor Boyd is well known for his lucid style, his wit and his gifts as a teacher. Such qualities, which are all too rare in medical books, add greatly to the value of this one and to read it is a profitable experience.

New material includes a critical review of the etiology of cancer with discussion of Blittner's milk

factor in relation to carcinoma of the breast, of avitaminosis in cancer of the mouth, and of Papendicolaou's vaginal smear method in diagnosing cancer of the cervix uteri. Because of the recent interest in the surgical treatment of certain congenital diseases of the heart an entirely new section has been added dealing with the pathological physiology of such lesions. Other new material includes a discussion of fibrous dysplasia of bone, inflammatory nodules of muscle in chronic arthritis, and fibrinosis of the back.

WILLIAM B. WARDMAN

AFTER a period of 5 years, a second edition of Duncan's extremely valuable volume on *Diseases of Metabolism*¹ has appeared. The chapters on special subjects are written by our leading authorities. They have been brought up to date, each chapter closing with a recent bibliography. The chapter on carbohydrate metabolism is by Professor C. N. H. Long and contains a clear and very complete exposition of the biochemistry of carbohydrate metabolism. That on protein metabolism is by Professor Abraham White with references to the newer work in electrophoretic studies of the plasma proteins as well as isotope studies of the intermediary metabolism of proteins. The chapter which deals with lipid metabolism was also written by Professor White and is followed by 206 references many of them of the literature of 1945.

The review of the mineral metabolism is by Professor Cantarow. It covers pathological clinical conditions as well as physiological mechanisms. The chapter on water balance is by Professor Peters of Yale University and is very complete. There is an interesting article on the subject of the metabolic aspects of blood disorders by Dr. Tocantins which gives a comprehensive review of the metabolic aspects in hematology. The vitamins and avitaminosis are extensively reviewed and illustrated by Dr. Spies and Dr. Butt.

There is a chapter on undernutrition by Professor L. H. Newburgh of Ann Arbor. Obesity is covered very thoroughly with explicit directions and many menus by Dr. Frank Evans.

Disturbances of intermediary metabolism, gout, diabetes, hyperinsulinism, are each covered by an outstanding authority. The present edition includes two new chapters. The diseases of the kidneys are described by Dr. Max Miller and Dr. Joseph M. Hayman, Jr. and disorders of the thyroid gland is a subject which is dealt with very completely and with comprehensive descriptions of iodine metabolism by Professor Alexander Winkler of Yale University.

This accumulation of modern and authoritative material on diseases of metabolism renders this volume one of great value to the student, internist, and surgeon who wish the last word on this subject.

PAUL STARR.

¹PHYSICAL PATHOLOGY. By William Boyd, M.D., Psychiatrist, M.E.C.P. (Edin.), F.R.C.P. (Lond.), F.L.D. (Berk.), M.D. (Calif.), F.R.C.S. (Edin.), Philadelphia and London: W. B. Saunders Co. 1947.

²DISEASES OF METABOLISM: DETAILED METHOD OF DIAGNOSIS AND TREATMENT. Edited by Garfield G. Dencker, M.D. and ed. Philadelphia and London: W. B. Saunders Co. 1947.

THE concise, well edited methodical *Year Book of Neurology, Psychiatry and Neurosurgery* brings in 700 pages a good summary of the important publications on neurology, psychiatry and neurosurgery published during the years of 1945 and 1946. Numerous important articles published in foreign countries have also been abstracted and broaden our contact with the great schools of Europe and South America.

The section on neurology emphasizes certain new acquisitions of knowledge of neuroanatomy and physiology. Numerous articles on the effect of new drugs on convulsive seizures such as tridione have been abstracted. A special place is given to the therapeutic effect of streptomycin, penicillin and the sulfonamides on the various types of meningitis and cerebral infection. Also the use of penicillin in neurosyphilis is widely discussed. The chapters on disorders of the cerebrovascular system and cerebral infection and intoxication show the great importance placed on the studies of these disorders.

The section on psychiatry includes a chapter on child psychiatry, schizophrenic reactions, toxic psychosis, psychosomatic disorders, military psychiatry and therapy. Interesting articles are abstracted on the psychiatric complications of tropical diseases, malaria, poliomyelitis, chronic inflammation of the central nervous system, head injuries, tuberculosis, and various other intoxications. Other articles deal with the psychiatric factors in duodenal ulcers and

other gastrointestinal disorders and their treatment. The psychiatric aspect of various skin affections is also well presented. The last chapter deals with numerous articles on shock therapy, its physiologic basis, its effects and complications, the use of various drugs, and some reports on the result of prefrontal lobotomies in psychiatric disorders.

For the first time a separate section in this year book is given to neurosurgery. As a direct result of research stimulated by the war and of war casualties an increasing number of articles published in the past year deal with nerve injuries and cranio-cerebral injuries and their treatment. The use of sulfonamides and penicillin has greatly reduced the instances of infection of intracranial wounds and has altered the methods of treating them and also of treating brain abscesses. Various types of peripheral nerve lesions and their treatment are discussed. Numerous articles also are related to the complications of peripheral nerve lesions, such as causalgia, phantom limb pain and related painful syndromes, and the various ways of treating them are presented. Other chapters deal with sympathetic surgery, the surgery and the diagnosis of herniated intervertebral discs and related myelopathies and spinal injuries. A few articles on intracranial vascular lesions and intracranial tumors are also abstracted. A new hemostatic agent, gelatin sponge, other new therapeutic methods, and operative procedures have found their important place in this book which is invaluable for the busy and interested physician who does not always have the time to read the various and numerous special used publications published all over the world.

GEORGE PERRET.

1946 YEAR BOOK OF NEUROLOGY, PSYCHIATRY AND NEUROSURGERY. Edited by HANS H. REICH, M.D., and MABEL G. MASTRO, M.D. for the section on Neurology; by NOLAN D. C. LEVINE, M.D. for the section on Psychiatry; and by PETERAL BAILEY, M.D. for the section on Neurosurgery. Chicago: The Year Book Publishers, 1947.

BOOKS RECEIVED

Books received are acknowledged in this department, and such acknowledgment must be regarded as a sufficient return for the courtesy of the sender. Selections will be made for review in the interests of our readers and as space permits.

A HANDBOOK FOR THE DIAGNOSIS OF CANCER OF THE UTERUS BY THE USE OF VAGINAL SMEARS. By Olive Gates, M.D. and Shields Warren, M.D. Cambridge, Mass. Harvard University Press, 1947.

THE ROTUNDA HOSPITAL, 1745-1945. By O'Donell T. D. Browne, M.B. M.A., M.A.O. (Univ. Dub.) F.R.C.P. (I.) F.R.C.O.G. Baltimore: Williams & Wilkins Co., 1947.

A TEXTBOOK ON PATHOLOGY OF LABOR, THE PUERPERIUM AND THE NEWBORN. By Charles O. McCormick, A.B. M.D., F.A.C.S. and ed. St. Louis: The C.V. Mosby Co., 1947.

ASPETTI DI PATOLOGIA PLACENTARE CON PREFAZIONE DI LUIGI BACCIALI E ALESSANDRO BUSICO. By Massimo Maciotta. Bologna: Nicola Zanichelli, Editore, 1947.

THE AMERICAN ILLUSTRATED MEDICAL DICTIONARY. A COMPLETE DICTIONARY OF THE TERMS USED IN MEDICINE, SURGERY, DENTISTRY, PHARMACY, CHEMISTRY, NURSING, VETERINARY SCIENCE, BIOLOGY. MEDICAL BIOGRAPHY

ETC., WITH THE PRONUNCIATION DERIVATION AND DEFINITION. By W. A. Newman Dorland, A.M., M.D. F.A.C.S. 2nd ed. Philadelphia and London: W. B. Saunders Co., 1947.

RECONSTRUCTIVE AND REPARATIVE SURGERY. By Hans May, M.D., F.A.C.S. Philadelphia: F. A. Davis Co. Publishers, 1947.

1946 TRANSACTIONS OF THE AMERICAN SOCIETY FOR THE STUDY OF STERILITY. Portland, Oregon: The Western Journal of Surgery Publishing Co., 1946.

SURGERY OF THE AMBLYOPIA PATIENT. By L. Kneer Ferguson, A.B. M.D., F.A.C.S. 2nd ed. Philadelphia, London: Montreal: J. B. Lippincott Co., 1947.

FUNDAMENTALS OF PSYCHIATRY. By Edward A. Strecker, M.D., Sc.D. LL.D., Litt. D. F.A.C.P. 4th ed. Philadelphia, London, Montreal: J. B. Lippincott Co., 1947.

THE REHABILITATION OF THE INJURED. Vol. 2: REMEDIAL GYMNASIUMS. By John H. C. Colson. London, Toronto, Melbourne, and Sydney: Cassell & Co., Ltd., 1947.

TRICHOMONAS VAGINALIS AND TRICHOMONIASIS. By Ray E. Truett, M.D. Springfield, Ill.: Charles C. Thomas, 1947.

CORRESPONDENCE

PLASMA CLOT GRAFT OF PERITONEUM FOR PERFORATIONS OF STOMACH

To the Editor: May I comment briefly on the article entitled Plasma Clot Graft of Peritoneum for Perforations of Stomach by Dr Joseph Bloom which appeared in the August, 1947 number of SURGICAL GYNECOLOGY AND OBSTETRICS? Dr Bloom used 9 dogs in his experiments, 4 of which survived. He explained the failures on the basis of mechanical defects in the technique of applying the grafts rather than as being due to digestion by the gastric juice, and this in spite of the fact that digestion was described in the protocols of some of his experiments.

It is my feeling that no graft of tissue could be used to close a defect in the stomach wall successfully unless something is done to protect the graft from the action of the gastric juice. Price and Lee have recently shown that virtually all living tissue when used as implants in the stomach wall are subject to digestion by the gastric juice and that the rate of digestion is greatly speeded up in the hyperacid stomach.

Neuhof in 1917 attempted to repair defects in the stomach by the use of living fascia. In all instances the implanted fascia was digested by the gastric juice and perforation occurred. He found however that if gastroenterostomy was also performed perforation was prevented and satisfactory healing ensued.

In 1930, I published the results of experimental work in which I used alcohol preserved ox fascia lata to repair defects in the stomach wall. In my early experiments perforations did not occur and I wondered if alcohol preserved fascia was more resistant to gastric juices than living fascia. This however did not appear logical as there was no reason for believing that the collagen fibers of the connective tissues were altered either chemically or physically by preservation in alcohol. I did not have to wonder about this long because in the next cases in the series the fascia in each instance became perforated due to digestion. I then did 5 cases in which I was able to prevent digestion of the implant by giving the dogs 3 ounces of bismuth subnitrate by stomach tube on the operating table as soon as the defect in the stomach was closed and then giving them 1 ounce daily in milk for the following 3 weeks. The bismuth probably protected the implant from gastric juice by forming a mechanical coating over it.

In view of the experiments of Neuhof, Price and Lee and myself I do not see how Dr Bloom can ex-

pect his peritoneal grafts to be successful as a routine procedure. Price and Lee have shown that while fibrous connective tissue is one of the most resistant of living tissues to the action of gastric juice. In spite of this, Neuhof's fascial implants were all digested unless he diminished the action of the gastric juice by performing a gastroenterostomy. Some of my implants of preserved ox fascia lata were digested and some were not. Apparently they could be protected as a routine by giving large doses of bismuth subnitrate. Certainly the experimental work already done is discouraging for the use of any tissue as an implant to repair a defect in the stomach wall. If the implant does remain intact however the ultimate result is excellent. In my successful experiments, the implant became covered on the outside with plating peritoneum with very few omental adhesions attached. The inside of the implant became covered with gastric mucosa which was perfectly normal in appearance.

I do not believe that oxytetracycline gauze used as a plug on the inside of the graft by Bloom in some of his experiments, could be counted upon as a routine to protect the graft from the action of the gastric juice. Oxytetracycline gauze implanted among living tissues soon becomes a mushy mass (unpublished experiments of my own) incapable of protecting a graft from the action of the gastric juice until the gastric mucosa could have time to grow across it.

Baltimore, Maryland.

AMOS R. KOONTZ.

THE PLASTIC SURGICAL CLOSURE OF DECUBITUS ULCERS IN PATIENTS WITH PARAPLEGIA

To the Editor: In the September issue of SURGICAL GYNECOLOGY AND OBSTETRICS, pp. 331-332, an article entitled The Plastic Surgical Closure of Decubitus Ulcers in Patients with Paraplegia appeared under my name and that of several of my assistants at the Veterans Hospital, Bronx, New York. Apparently I did not conform to the procedure of the Veterans Administration in that I failed to obtain permission of the Chief Medical Director of the Veterans Administration to publish this article.

Information has come to me that the Chief Medical Director has given his permission and that there is a standard footnote which should be published under such article. This footnote reads as follows:

Published with the permission of the Chief Medical Director, Department of Medicine and Surgery, Veterans Administration, who assumes no responsibility for the opinions expressed or conclusions drawn by the authors."

New York, New York

HERBERT CONWAY

*Prior, P. B. and Lee, T. F. Surg. Gyn. Obst., 91, 83, 6, 72-74, 1947, 84, 959-96.

Neuhof, H. Surg. Gyn. Obst., 91, 24, 383-437.

Koontz, A. R. South. M. J., 90, 1, 7-13.

November, 1947

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the Arabs seem to have known about it. The three types of his serpentine disease correspond roughly to the three stages of syphilis.

It seems odd that so universal a disease as syphilis could have once been confined to the island of Haiti, and that the handful of sailors who returned with Columbus from the first voyage could have contaminated the whole of Europe within eighteen months. But it is just as odd that no pre-Columbian syphilitic skull has appeared in Europe, although many have been dug up in America. Microbial evolution may account for the change in a hitherto innocuous germ, since definite variations in virulence are known to occur in bacterial transition to a strange host. Certain it is that a syphilitic tidal wave engulfed Europe in the closing years of the fifteenth century. Isolated disease descriptions by medieval writers suggest various syphilitic stages, but there seems to have been no widespread contagion prior to the return of Columbus. However it should be noted that the close of the century marked the break-down of the so-called leprosy of the Middle Ages into a dermatologic potpourri, some of which may have been venereal. And to say that Charles VIII and his army spread the new disease as they returned from the siege of Naples in 1496 is an anachronism for historians now agree that there was no such

That the illness of Columbus on Voyage II was due to secondary syphilis is, of course, possible. But it should be noted that his trials and tribulations while visiting the newly discovered islands of the West Indies were enough to aggravate any infection. He had almost no sleep for thirty three days, and was utterly exhausted by the terrible wear and tear of mind and body. Leaving his colonists racked by sickness and hunger he returned to Cadix in June of 1496.

Two years later he set out on Voyage III and this time he is said to have been incapacitated by a severe attack of gout, followed by a violent fever. This is the first time that he suggests any pain in his joints. That he really had gout is doubtful, for gout seldom affects so abstemious a man as Columbus. Furthermore his illness was accompanied by a high fever and occurred for the first time during the summer months. Nor was it confined to a few of the smaller joints. Rheumatic fever has been suggested, but ordinarily rheumatic fever does not resolve into chronic rheumatism of the kind with which Columbus continued to be afflicted. His joint pains eventually subsided into what seems to have been chronic polyarticular arthritis. The pain and rigidity became gradually progressive and never left him. In

general the account of his malady sounds like rheumatoid arthritis, starting with an acute attack accompanied by high fever. The conditions under which he lived could very easily have furnished the predisposing and exciting causes.

In *Authentic Letters of Columbus* translated by J. I. Rodriguez, the Admiral writes to son Diego "The ailment which afflicts me is so bad and the cold weather aggravates it so much, my illness prevents me writing except at night. In the day time my hands have no strength. In rheumatoid arthritis the hands are often the first to be affected the fingers eventually becoming gnarled and rigid."

It was during this same voyage that his companions noted the peculiar condition of Columbus's mind. On Christmas Day 1499 he seemed strangely introverted and spent long hours in self absorption. Of this occurrence Columbus himself relates that he heard a voice from heaven saying "Take courage. Be not afraid, nor fear. I will provide for all."

His return journey was made in chains. Much abuse has been heaped upon Bobadilla, newly appointed governor of the new islands for his cruel and dishonorable treatment of Columbus but with self-conscious martyrdom for he directed that his chains be buried with him. To be shipped back home like a common felon could have aroused sufficient emotional trauma to produce at least a few psychopathic symptoms. The reason for Bobadilla's actions may be laid to his own inferiority complex, a mass of fear, ignorance and jealousy conflicting with Columbus's simple and funnily self righteous, and rather domineering manner. Although Columbus was a natural commander he was no organizer and probably had an irritating tendency to make a mess of administrative affairs.

But it is also possible that Bobadilla suspected that Columbus was insane and simply took the usual measures of dealing with men possessed with a devil. Such men may have been merely possessed of a splotch. On the other hand geniuses frequently feel themselves to be inspired and Columbus's conception of himself as the Christ Bearer to the New World may have had a purely psychological basis born of implicit faith in his own great destiny and encouraged by the adulation and honors heaped upon him after Voyage I.

On the way home he wrote a long confused letter to Doña Juana de la Torre friend to Isabella a letter that to some psychiatrists gives evidence of a psychotic mind. Upon arrival his chains were removed and both he and Isabella

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COLLECTIVE REVIEW

THE CAUSES AND TREATMENT OF SCIATIC PAIN

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"Observational inquiry in clinical medicine may give results that are questionable on the one hand because too much value has been given to conclusions essentially based on intuition and on the other hand because the possibilities of exact observation and record have been exaggerated. We are all familiar with instances of large and imposing masses of records vitiated at their very base by the preconceptions of their compilers, or by the impossibility of precise records, and with instances of the hieratic pronouncement that rises superior to the need for proof."

Wilfred Trotter

"The development of a special sense is often followed by the atrophy of common sense."

Arbuthnot Lane.

"It is necessary not only to find the cause of the patient's disability and to remove it, but also to convince him that he has been relieved and that he is able to return to his work."

J. Grafton Love and Maurice Walsh
writing on "Protruded Intervertebral Disc."

THE prolapsed intervertebral disc is now regarded by many authorities as the commonest if not the only cause of sciatic pain. This is a view which has gained wide support during the War. It is probable that during the war years there has been an absolute increase in the frequency of prolapsed discs, because large numbers of young men have been removed from their normal environment and subjected to abnormal strains for which many of them were unfitted. At the same time these cases have been segregated in "centers" where large masses of records have been compiled. These are necessarily the records of highly selected series, and they tend naturally to exaggerate the relative importance of the prolapsed disc.

It is, of course, true that when sciatica is accompanied by abnormal neurological signs the clinical aspect is that of a lesion at the root level, of which a prolapsed disc is a very likely cause. But even in such cases, actual observation shows that the prolapsed disc does not account for all cases.

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every surgeon familiar with this problem knows that in some of them the discs are found to be normal at operation.

The other group (it is numerically important) in which there are no abnormal neurological signs, contains cases in which the pain is referred. For these there are several possibilities in diagnosis. The prolapsed disc is not the only factor.

It is proposed in this article to review the nature and causes of sciatic pain and to recount the results obtained with various methods of treatment in a series of 298 cases.

TABLE I — 298 CASES OF SCIATIC PAIN

Military	104	Not
Civilian	145	selected
Operative	49	
Total	298	

THE NATURE OF SCIATIC PAIN

A. There is an important element of referred pain in most cases of sciatica.

Thus, we find that sciatic pain can nearly always be abolished by a local subcutaneous injection of novocain over the painful area.

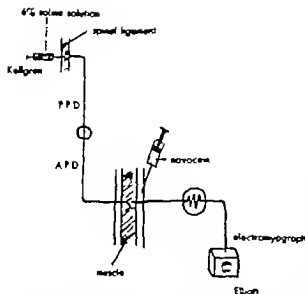


Fig. To illustrate the mechanism of referred pain, as demonstrated in Kellgren's and Elliott's experiments. PPD = posterior primary division. APD = anterior primary division.

Further in cases of sciatica we constantly find a tender area over the sciatic notch. Local subcutaneous injection of novocain at this tender area abolishes the tenderness, and, more surprising, it causes Lasègue's sign to disappear or to become much less marked.

When Kellgren's experiment stimulating the spinal ligaments with 6 per cent saline solution (Fig. 1) is repeated we find that the injection always causes local backache at the site of injection. It sometimes causes, in addition a referred pain in the leg. This pain is not referred as Kellgren believed on a segmental basis. It is constant in distribution, in the nature of a dull aching discomfort, and poorly localized. The patient has difficulty in saying exactly where it is. The pain is, in fact, very similar to that in many cases of sciatica. It is immediately relieved by a subcutaneous injection of novocain over the painful area. And of course an injection of novocain into the spinal area which was stimulated will immediately abolish both the local backache and the referred pain.

It will be remembered that Elliott investigated sciatica of various types, including several cases of proved prolapsed disc. Using the electromyograph he showed that in sciatica of all types the pain is associated with muscle spasm in the painful area. He then repeated Kellgren's experiment producing referred sciatic pain artificially by chemical stimulation of the spinal ligaments with 6 per cent saline solution. This pain also was

shown by the electromyograph to be associated with muscle spasm.

Elliott considers that muscle spasm may be responsible in cases of sciatica for a considerable part of the patient's total discomfort. The spasm may be produced either by direct irritation of a nerve root as in the cases he investigated in which a prolapsed disc was subsequently found at operation, or by a stimulus which arises outside the nerve roots, through a reflex path involving the anterior horn cells. In the latter case, referred sciatic pain is produced by stimulation of those posterior primary divisions whose corresponding anterior primary divisions form the sciatic system (Fig. 1). The experimental demonstration of this by Kellgren's method of chemical stimulation has already been mentioned. The clinical application depends upon the anatomical distribution of the nerves concerned.

The anterior primary divisions of the fourth and fifth lumbar nerves and the first, second, and third sacral nerves take part in the formation of the sciatic nerve. The spinal musculature, the intervertebral joints, the posterior common ligament of the spine, the ligamentum flavum, and the interspinous and supraspinous ligaments are innervated by the posterior primary divisions of the same nerves and by recurrent twigs (nervus rami vertebralis, Luschka) formed of branches from the spinal nerves and from the sympathetic chain, which turn back into the spinal canal through the intervertebral foramina. Stimuli originating in these spinal structures may cause pain which is referred to areas supplied by the anterior primary divisions of the spinal nerves concerned.

Cases of referred pain are numerically important. In our series of 249 consecutive cases, there were 129 (52%) of the referred type without neurological signs.

B. So far as direct sciatic pain is concerned, it is obvious clinically in many cases, that the nerve is affected at a root level. In this connection the anatomical relations of the roots are important.

The nerve roots leave the canal via the intervertebral foramina. The foramina are pear-shaped, with the narrow end downward (Fig. 2) and the roots lie in the narrow inferior parts of the foramina. (Fig. 3). In the lumbar region the foramina become progressively smaller as the spine is descended. The nerve roots, however, become larger and so the lower lumbar nerve roots, which are the thickest, lie in the smallest lumbar foramina (Danforth and Wilson) and what is more, in the narrow inferior parts of these apertures, to which they are anchored by thin bands of fibrous tissue, which sometimes are shown by dissection (Fig. 7.)



Fig. 2

Fig. 2. Model to show intervertebral foramina. Note particularly the lateral extension of the ligamentum flavum and its attachment to the capsule of the lateral joint. The foramina are pear shaped.



Fig. 3

Fig. 3. Nerve root in narrow inferior part of foramen closely related to disc, lateral joint, and ligamentum flavum.



Fig. 4

Fig. 4. Model showing attachment of ligamentum flavum to lamina and articular process.

As they run obliquely downward and outward through the foramina, the nerve roots are related

1 Anteriorly to the intervertebral disc and to the margins of the vertebral bodies above and below. Note that the anterior wall of that narrow inferior part of the foramen in which the nerve root lies is formed principally by the disc. The relation between disc and root is intimate.

2 Posteriorly to the ligamentum flavum to the capsule of the lateral joint and to the antero-lateral surface of the lower articular facet.

The ligamentum flavum is normally from 2 to 3 mm. thick. It is attached below to the upper margin of the lamina of the lower vertebra and extends laterally to a variable extent as a continuous sheet attached to the anterior and upper borders of the upper articular facet of this vertebra, and to the capsule of the intervertebral joint (Fig. 4). Above, the ligamentum flavum is attached to the anterior surface of the lamina of the upper vertebra and to the anterior surface of the root of the lower articular process of this vertebra across which it extends laterally to a variable extent toward the root of the transverse process. There is a free lateral border which forms the posterior boundary of the outer mouth of the intervertebral foramen. This lateral border is closely related to the issuing nerve root (Fig. 5).

Each foramen transmits a spinal nerve, sympathetic filaments, blood vessels, and lymphatics.

The space is normally adequate to contain these structures and their surrounding fat, but there is little room to spare and minor pathological changes in the walls of the foramen may suffice to cause pain.

Emerging from the foramina the nerves divide into the anterior and posterior primary divisions and the fourth anterior primary division turns downward in front of the transverse process of the



Fig. 5. Dissection of lumbar spine viewed from the side. The fourth and fifth transverse processes have been removed. The third, fourth, and fifth nerves are seen emerging from the foramina. At each foramen the lateral edge of the ligamentum flavum is clearly seen, in contact with the issuing root forming the posterior boundary of the intervertebral foramen.



Fig. 8.



Fig. 9.

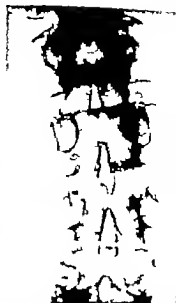


Fig. 10.

Fig. 8. Oblique view of lateral joints (Normal).
Fig. 9. Oblique view to show arthritic change in bamboo-lateral joint.

Fig. 10. Roentgenogram showing arthritis of lateral joint in ankylosing spondylitis. (Film lent by Dr. Campbell Golding).

ical arthritis, frequently demonstrable in good roentgenograms. This arthritis might influence the adjacent nerve root either by swelling of the joint itself or by an associated periarticular edema and engorgement. And clearly an arthritic lateral joint (innervated by the posterior primary division of a spinal nerve) might be a source of referred pain. Putti interpreted the stiffness of the spine, so often associated with sciatica, as a clinical sign of spinal arthritis. Lateral deviations of the spine (sciatic scoliosis), he also regarded as a product of spinal arthritis.

Bankart agrees with these views of Putti, but there are not many other supporters. In fact the idea has been dismissed in a summary fashion by some writers (Hurst). The available evidence concerning the theory is given herewith.

We have already pointed out how close is the relation between the lateral joints and the nerve roots. As the root enters the intervertebral canal it lies actually in contact with the capsule of the corresponding lateral joint (Fig. 6).

In some specimens which we dissected, osteoarthritic changes had occurred in the lateral joints, and were associated with remarkable changes around the nerve roots. Adhesions of varying density had formed around the nerve roots in the intervertebral foramina (Fig. 7). In one specimen there was also a dense fibrosis around the nerve roots, outside the intervertebral foramina where they lie on the lateral aspect of the

vertebral bodies, at the roots of the transverse processes. Here they were surrounded by dense fibrous tissue, and could be separated from the bone only by sharp dissection. The fibrous network was intimately connected with the adjacent muscles. Putti and Logroscino made similar observations. In many specimens they found arthritic changes in the joints with ulceration and fibrillation of the articular cartilage, hypertrophic synovial villi, loose bodies, capsular edema, and adhesions between the joint capsule and the meningeal covering of the adjacent nerve roots. In some cases arthritic changes which could not be detected radiologically were found on dissection. From these investigations Putti concluded that arthritic changes are present in the lateral intervertebral joints of most people more than 40 years of age.

Unfortunately it is more difficult to demonstrate arthritic changes in the lateral joints of the living subject. The clinical signs, stiffness of the spine and pain on forced movements, are obvious but these signs may also be produced by other lesions, for instance by degeneration of the intervertebral discs. Roentgenography the obvious "court of appeal," is useless unless the films are absolutely "first class," a standard not always attained in routine work. Thus, we examined the roentgenograms of the 298 cases which are considered in this article, but the results were not worth reporting so far as the lateral joints were



Fig. 11. A case of bilateral sacralization of the fifth lumbar vertebra. In the lateral view marked congenital narrowing of the fifth lumbar disc is seen. There is, in addition, acquired narrowing of the fourth disc with slight posterior displacement of the fourth lumbar body and osteophyte formation on the posterior lower edge of this.

concerned, because in many of the films these joints were not clearly shown.

What then is the position of spinal arthritis considered as a cause of sciatica?

1 Arthritis of the lateral joints does occur and is probably common.

2 For technical reasons it is difficult to demonstrate arthritis of the lateral joints.

3 On anatomical and physiological grounds it appears that arthritis of these joints may cause sciatica, either as a referred pain, or because of associated periradicular changes. It is an explanation which may reasonably be considered when the clinical picture is that of a lesion at root level but the discs are found to be normal at operation.

In our consecutive series of 249 cases, spinal arthritis was considered to be the responsible factor in 41 cases (17%).

In connection with lateral joint arthritis the association of sciatica with ankylosing spondylitis is interesting. This disease sometimes presents itself as sciatica. Golding recorded 98 cases, of which 14 (11%) had at first been diagnosed as sciatica. In our series of 298 cases there were 4 in which the sciatic pain was a symptom of

ankylosing spondylitis. In all 4 cases the pain was of the referred type—there were no abnormal neurological signs. It seems likely that in such cases the sciatic pain is caused by the lateral joint arthritis which occurs in ankylosing spondylitis (Fig. 10).

Sacralization of the fifth lumbar vertebra occurs frequently as a congenital anomaly and does of course, materially alter the circumstances in which the fifth lumbar root leaves the spine, but since the nerves and the vertebral column develop *pari passu* it seems improbable that the enlarged transverse process, as such would affect the function of the fifth root. Secondary pathological changes may possibly do so. Thus, the joint between an enlarged fifth transverse process and the lateral mass of the sacrum may become arthritic and so affect the contiguous nerve root. If the sacralization is unilateral it seems likely that abnormal strain may be thrown upon the lower lateral joints on the opposite side, predisposing them toward arthritic change. The most important result of sacralization, however is the altered status of the *fourth* lumbar disc. Sacralization fixes the fifth lumbar segment. It follows that the maximum strain which normally falls upon this

segment as the lowest point of the mobile spinal column must now be taken by the fourth lumbar disc. Hence, there is in these cases a tendency toward degeneration of the fourth disc. This has been noted by Capener. The patient whose roentgenograms are shown in Figure 11 is a case in point. There is bilateral sacralization of the fifth lumbar vertebra, with congenital narrowing of the lumbosacral disc. There is also acquired narrowing of the fourth lumbar disc, with osteophyte formation at the lower posterior angle of the fourth lumbar vertebra.

Acquired narrowing of an intervertebral disc may be distinguished from congenital narrowing by the associated sclerosis of the adjacent bone margins and by osteophyte formation at their edges. The pathology of disc degeneration with subsequent narrowing causing arthritic changes in the spine has been studied by Keyes and Compere. A narrow disc affects the size of the corresponding intervertebral foramina (Hadley). Subluxation of the lateral joints occurs with upward displacement of the lower articular facets and slight backward displacement of the upper vertebral body in relation to the lower (Fig. 11). Both these factors decrease the size of the foramen, and the combined effect may be significant, especially in the case of the lumbosacral junction, where the smallest foramen of the lumbar series transmits the largest lumbar root.

Meyerding (62-63) quotes a series of 745 patients with spondylolisthesis of whom 10.7 per cent had coincident sciatica; nearly all of these patients had either grade I or grade II spondylolisthesis. There is, of course, a possibility of pressure by the posterior edge of the lower vertebra and, in addition, spondylolisthesis increases the risk of protrusion of a disc.

Our series includes one case of spondylolisthesis, but laminectomy revealed no prolapse.

Lesions of the sacroiliac joints are not often the cause of sciatica. Sciatica of a referred type, without neurological signs, is occasionally associated with sacroiliac strain, and both are relieved by manipulation. Porter mentions 3 cases of sacroiliac tuberculosis in which sciatic pain was present. I have never seen osteoarthritis of the hip joint as a cause of sciatica although it is often described as such.

Sciatic neuritis. Does true sciatic neuritis occur? Biopsy and postmortem reports are unfortunately scanty. Hunt recorded a series of cases in which the sciatic nerve was thickened and edematous, and on section showed vascular engorgement and inflammatory exudate between the perineurium and the endoneurium. The changes

were not marked. Denny Brown reports the case of a woman with disseminated sclerosis, who developed sciatica. She collapsed and died while having an oxygen infection around the nerve. At autopsy the sciatic nerve on the right side was swollen over the whole of its course from the sciatic notch to the popliteal region and the blood vessels were noticeably engorged. There were no signs of adhesions or other fibrous tissue changes. A small piece of the nerve was made available by the Coroner for section. Nothing abnormal was seen in the low power view. Under high power it was seen that the vessels were engorged and there was lymphocytic infiltration around some small venules. The perineurium around some of the nerve fibers was lifted up by an exudate. The nerve fibers themselves appeared to be intact.

This is the pathology of acute interstitial neuritis. It would produce severe pain and marked tenderness over the course of the nerve with fasciculation and wasting. Although this type of case is seldom seen in surgical practice it is fully described by physicians (Walshe, Cohen) and is referred to as "true sciatica." Complete recovery after a few weeks of conservative treatment is not uncommon. Cohen points out that true sciatica sometimes presents the characteristics of a febrile illness, having a sudden onset, with a raised temperature during the first few days.

The functional element in sciatica. A functional element is present in many cases of sciatica. The purely functional cases and the malingers are rare. However many patients who have true sciatica with an organic basis develop, for one reason or another a functional "overlay" which makes the pain worse, obscures the diagnosis, makes the condition persist, and impairs the chance of successful treatment.

CLINICAL EXAMINATION

The diagnostic possibilities thus briefly reviewed must be considered in the light of a careful clinical examination which may be conveniently carried out on the following plan:

History

Lumbar spine—shape, mobility, and tenderness in the back and the lower limb trigger points

Lastgue's sign

Wasting

Motor power

Tendon reflexes

X-ray examination

Rectal examination

Focal sepsis

W.R.

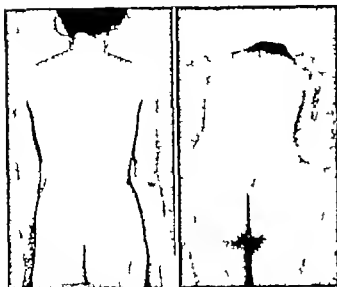


Fig. 12. Right sided sciatica. On bending forward the spine deviates toward the painful side. At operation a "concealed disc" (lumbosacral) was found.

Urine

Lumbar puncture

History Pain in the back described by the patient as lumbago is almost invariable. It may precede or be coincident with the sciatic pain. The backache may be fibrositic in origin; it may be caused by degenerative changes in, or injury to, an intervertebral disc, or it may be associated with spinal arthritis.

The prevalence of injury as a causative or precipitating factor has been stressed too much in recent literature. Only a relatively small proportion (13%) of proved cases of prolapsed disc in our series had a history of injury definite enough to be held responsible. It seems probable that injury may precipitate the prolapse of an already degenerate disc, but only a very severe injury could possibly cause prolapse of a normal disc. Friberg has shown experimentally that the normal intervertebral disc is capable of withstanding without damage, very severe strain. In a fresh cadaver he punched a hole in the annulus of a lumbar disc. No prolapse occurred, nor did any appear after repeated violent movements of the spine or after great axial pressure. Moreover when the cut was deepened to the nucleus itself and a prolapse had appeared its size was not affected or only very slightly by movements of the vertebrae.

The influence of trauma in the production of prolapsed disc is, of course, an important medico-legal point. Trauma can be only a precipitating factor, i.e., an injury can cause a prolapse only if the disc is already degenerate.



Fig. 13. Fixed lumbar lordosis associated with right sided sciatica and spinal arthritis.

On the other hand there appears quite often to be a definite connection between exposure to adverse climatic conditions and the onset of lumbago and sciatica. Sleeping out on wet ground, working in the rain and cold, or sitting on wet or cold surfaces, often precipitates the first attack, presumably of a fibrositic type.

Coughing, sneezing, heavy lifting and straining of any sort usually cause exacerbation of the sciatic pain, whatever the cause of the latter may be. No special diagnostic significance, indicating a prolapsed disc, should be attached to this symptom.

The state of the sphincters should be determined by careful questioning. Loss of control may indicate an intraspinal lesion.

The history of the previous attacks and their duration may help in the prognosis and may be a guide to treatment.

The lumbar spine. The back should be examined with regard to shape, mobility and tenderness. The range of movement of the lumbar spine is tested systematically. Some limitation is nearly always observed ranging from slight stiffness to absolute rigidity. Extension is tested by making the patient lean backward from the erect position; flexion by bending forward in an attempt to touch his toes with the knees straight. The latter move-



Fig. 14. A typical disc spine with left sciatica. There is lumbar kyphosis and slight spinal list to the right. The spine is almost rigid. At operation a constricted disc (lumbosacral) was found.



Fig. 15. A typical disc spine with left sided sciatica. New spinal list to the right. The spine is almost rigid. The scar of an unsuccessful Ober's operation is seen. On laminectomy a degenerate lumbosacral disc was found.

ment may be limited either by a true stiffness of the spine or by a painful spasm of the hamstrings. To differentiate between the two the movement of flexion is next tested with the patient sitting on a couch the knees and the hips being flexed to relax the hamstrings. Lateral flexion is estimated by asking the patient to bend sideways from the erect position.

Only rarely (in cases of low sciatica) will the shape and mobility of the spine be normal.

In mild cases of the fibrositic variety there is frequently an associated postural defect—usually a hollow back the lumbar lordosis being increased. In such cases the spine is mobile although movement may be painful.

When the sciatica is caused by protrusion or degeneration of a disc, by hypertrophy of the ligamentum flavum or by spinal arthritis, gross deviations from the normal shape of the spine are observed and the spine may be stiff.

1. A common abnormality is a lateral deviation of the spine which appears only during flexion. When the patient stands upright his spine is straight, but on bending forward the spine deviates to one side, toward or away from the side of the sciatica (Fig. 12).

2. There may be a fixed exaggerated lordosis. The lumbar spine is stiff and moves en bloc when the patient bends forward; spasm of the erector spinae muscles being visible and palpable. The movement of flexion takes place only at the hips.

This type of spine is commonly produced by spinal arthritis (Fig. 13).

3. The flat or kyphotic lumbar spine, sciatic scoliosis, and alternating scoliosis are usually due to abnormalities of an intervertebral disc or ligamentum flavum. In the case of a flat lumbar spine the lumbar lordosis is obliterated and the spine is very stiff. In the kyphotic lumbar spine the deformity has progressed a stage further the lumbar curve being reversed (Fig. 14). In the sciatic scoliosis we have a flat or kyphotic lumbar spine which also deviates to one side, usually away from the side of the sciatica, but sometimes toward it (Fig. 15). The lateral deviation starts from a low level, at the lumbosacral junction or just above it, and from this point the spine leans sideways. It is a list to one side rather than a rounded curvature of the sort usually associated with the word scoliosis. The deformity is fixed. Extension is severely limited. The lateral inclination cannot be overcome either actively or passively. Attempts to straighten the spine are painful. The deformity persists when the patient lies down. Under anesthesia the lateral deviation disappears but if there is an associated lumbar kyphosis, this usually persists. Alternating scoliosis is rare. In these cases there is a sciatic scoliosis, but the lateral deviation varies in direction from time to time. For instance the change from one side to the other may be produced when the patient bends forward (Figs. 16 and 17).

cried and sobbed together. In succeeding months he became absorbed in the mysticism of the Bible, and, as "Ambassador of God" importuned the Pope for another crusade to free the Holy Sepulchre from the infidels. His sense of persecution grew stronger and stronger. If this was tertiary syphilis, it would indicate a more rapid progression than usual, for it was only about eight years since the first voyage on which the primary infection may be said to have occurred. However this would coincide with the rapid action of the spirochete in a member of a completely non-immunized group. Diagnosis is difficult, because of the chaotic mass of controversial material, but a detached historical spirit recognizes that, apart from the ophthalmia and the rheumatoid arthritis, syphilis would account for all of his symptoms, both in their nature and in the relative times of their occurrence. To explain them otherwise means considering a list of single and distinct pathological conditions, including relapsing fever typhus or typhoid, rheumatic fever and valvular heart disease, followed by paranoia.

In the spring of 1502 Columbus began his fourth and last "farewell tour" of America. He wanted to find a strait through which he might sail west into Portuguese Asia. During most of the voyage he was too sick to leave his cabin. Cardiac dropsy added to the pains of arthritis made his life miserable enough without the hardships of exploration. Poor food and bad weather plagued his little fleet. Storms wrenched and strained his crazy worm-eaten ships as they wandered painfully among the keys and shoals he had named the Garden of the Queen. Mutiny blazed up in his crews. Shipwreck ran him aground on Jamaica, where the Nazi-like conduct of his men started the first American Revolution. Only his ability to foretell an eclipse of the moon saved him and them from the revenge of the superstitious natives.

Arriving in Spain two years later he was so ill that he had to be carried ashore. Meanwhile, friend Isabella had died of an intestinal tumor untreated because she was too modest to allow herself to be examined. Her scamp of a husband, Ferdinand, always hostile, was of no help to the

discoverer of Spain's new empire. Poor Columbus lived in misery attempting to follow the court on its interminable peregrinations. Unable to endure the jittery paces of the Andalusian horses, he was forced to hoist his swollen legs on mule-back or be carried in litters.

Valladolid lies in a cleft among barren, treeless mountains, a city drowsing away the hours in its silent convents and dusty streets. There, heart sick and weary Columbus dragged himself after the court for the last time. There he lingered painfully until May of 1506 when his diseased heart valves finally played themselves out. He handed over into the hands of God his proud, courageous spirit.

A battered, wrecked old man,
Thrown on this savage shore, far far from home
Pent by the sea and dark rebellious brows
My terminus near
The clouds already closing in upon me,
The voyage balk'd, the course disputed lost,
I yield my ships to Thee

Walt Whitman.

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Fig. 16. A case of right sciatica with alternating scoliosis. In the erect position the spine deviates to the left. During flexion the spine deviates to the right. Note the wasting and loss of tone in the right buttock. At operation a "concealed disc" (lumbosacral) was found.

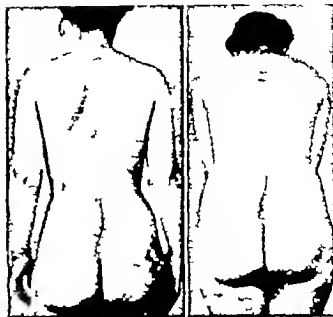


Fig. 17. The same case as in Figure 16, after operation. A laminectomy with ample bone removal was performed. A "concealed disc" was exposed but no disc material was removed. The spinal deformity has disappeared and the sciatic pain is cured.

It is probable that each of these deformities represents a mechanism designed to protect the nerve roots from pressure. There are several factors to be considered. Thus, extension of the spine diminishes the size of the intervertebral foramina by elevating the inferior articular process at each joint, and so may increase the sciatic pain. But, extension of the spine also relaxes the nerve roots and meninges, and so it may relieve the pressure on a nerve root or permit the nerve to slide into a less vulnerable position. For instance one of our patients could obtain relief only by lying on her face, i.e. by extending her lumbar spine. Again, flexion of the lumbar spine (lumbar kyphosis) tends to throw into prominence the protrusion of a disc—an undesirable effect—but at the same time it increases the size of the intervertebral foramina and for this reason may be a position of ease. Contralateral scoliosis similarly has a dual effect. It increases the size of the intervertebral foramina on the painful side but also increases the tension in the nerve roots on that side. Ipsilateral scoliosis, on the other hand, diminishes the foramina on the painful side, but also relaxes the nerve roots on that side. The clinical result thus depends upon the balance of opposed factors and differs from case to case and in some instances from time to time in the same case (alternating scoliosis).

Tenderness in the back is variable. In functional cases there is widespread exaggerated ten-

derness which disappears when the patient's attention is distracted. In fibrositis, with which a functional element is frequently associated the tenderness is similar.

Localized tenderness over a spinous process, an interspinous process, or an interspinous interval may be a guide to the level of a prolapsed disc but this sign is unreliable.

Nearly always there is localized tenderness over the sciatic notch, but apart from this tenderness in the leg is uncommon. Pressure over the tender area in the buttock may cause radiation of pain down the back of the thigh but trigger points elsewhere are unusual.

Lasègue's sign. Stretching the sciatic nerve increases the sciatic pain and serves as a measure of the severity of the sciatica. The test is performed with the patient lying supine on a couch. With the knee kept extended the affected leg is lifted off the couch. In severe cases the hip flexion is resisted by muscle spasm when the movement has progressed through only 10 or 20 degrees. In mild cases an arc of 70 or 80 degrees is permitted. Flexion of the sound limb in many cases causes either a pain in the lower back or an accession of sciatic pain in the affected leg presumably because this movement stretches the structures in the lower back, including the nerve roots on both sides. Ingenious attempts have been made, by modifying the straight leg raising test to differentiate between the various causes of sciatica.

The "head and knee" test described by Young is an example. These refinements have little clinical value.

Wasting may be apparent in the buttock, thigh, or leg. The distribution of the wasting may give some indication of the level of the lesion. If the first sacral root is affected, wasting of the outer buttock (gluteus medius) and of the calf follows, and the ankle jerk is lost. Interference with the fifth lumbar root causes wasting of the anterior tibial compartment, and the ankle jerk is spared.

Loss of power Actual loss of muscle power is rare, but an apparent loss of power is often seen, because muscle effort is painful and therefore voluntarily limited. Note that muscle power should be tested with the patient standing as well as lying. A slight weakness of the calf muscles, for instance, is best detected by asking the patient to stand on tiptoe.

Abnormalities of sensation. Subjective disturbances (paresthesia or a feeling of numbness) may be the first symptom of sensory impairment. Hyperalgesia and hyperesthesia may occur. Later actual sensory impairment (light touch, pinprick, postural, or vibration sense) may be found. Although the delineation of the dermatomes is uncertain, and more than one root must suffer significant damage before sensory loss is observed, yet a careful study of the sensory changes may help to localize the responsible lesion (Bradford and Spurling, Pennybacker, Kellgren).

The fifth lumbar root territory includes the dorsum of the foot and the big toe. The first sacral root supplies the outer side of the foot and the outer two toes.

Tendon reflexes: The knee jerk depends on the second, third, and fourth lumbar segments. It is not, as a rule, affected in cases of sciatica. It may actually be enhanced if the tone of the hamstrings is impaired. The ankle jerk is frequently lost or depressed. It depends upon the roots of the fifth lumbar, first sacral, and possibly the second sacral nerves. According to Bradford and Spurling the ankle jerk is affected in 30 per cent of lumbosacral disc prolapses, and in 25 per cent of fourth lumbar disc prolapses, but it must be noted that the ankle jerk may also be affected by a prolapse at a higher level. The ankle jerk is also lost in cases of interstitial neuritis of the sciatic nerve.

Once lost, the ankle jerk may not return, although the sciatica may be cured. An absent ankle jerk does not necessarily indicate active sciatica. It may be the relic of a previous attack.

X-ray examination of the lumbar spine and pelvis is an essential part of the examination of all cases of sciatica. The lateral view should be

centered on the fifth lumbar vertebra because the majority of the vertebral lesions which may cause sciatica occur in the lower part of the lumbar spine.

Contrast roentgenography is still used in some clinics for the diagnosis of disc protrusions.

Adverse effects after the injection of iodized oil have frequently been recorded. Verbruggen reports pain in the legs, headache, nausea, vomiting, retention of urine, pyrexia, meningismus, and an increased cell count in the cerebrospinal fluid. Marcovitch and Walker report pyrexia, vomiting, stiffness of the neck, and increase of cells and protein in the cerebrospinal fluid. They report a fatal case in which, at postmortem, acute meningeal reactions were found in the spine and around the brain stem. Sicard and Forestier noted a brief pleocytosis. Globus found a variable pleocytosis, but there were no adverse effects clinically. Lundblom noted a pleocytosis and positive Hönne and Pandy tests, these signs disappearing within a month. Klose and Peiper reported transient headaches, but no other ill effects. MacLennan, Wartenberg, Sharpe and Peterson, Bergerhoff, Noone, Fumarola and Enderle, Doust and others, also found adverse clinical and pathological changes after the use of iodized oil in the theca. Experimental work in animals has produced similar results (Brucker and Propper, Davis, Haven, and Stone, and Ayer and Mixer).

In 3 of our cases in which lipiodol had been used the roots of the cauda equina were, at operation, seen to be matted together by a yellow fibrous exudate. The meninges were thickened and injected. These pathological changes were attributed to the use of lipiodol. The patients suffered no permanent harm. Of a further 8 cases in which lipiodol was used and not removed, 2 were made permanently worse (the sciatica was permanently exacerbated) but the remaining 7 presented no immediate ill effects. Two years later 3 of the 7 were traced and no ill effects had appeared.

Thus it is clear that lipiodol may cause pathological changes in the meninges and nerve roots, but permanent harm is unusual. With pantopaque or with air there is little risk, but the really important fault of contrast roentgenography is its unreliability remains. With proper roentgen technique a large protrusion would doubtless be revealed by contrast roentgenography in every case. However in such cases the diagnosis is easily made and the level of the lesion may be determined by clinical examination. On the other hand, a small protrusion, a "concealed" disc, a degenerated disc which is not protruding, and even a disc protruding to a fair degree in a lateral situation, will not

be shown by contrast roentgenography. In other cases contrast roentgenography may falsely indicate a protrusion which does not really exist. Fortunately the plain roentgenogram often indicates the presence and the level of a degenerate disc. Very slight narrowing of a disc space may be significant if taken in conjunction with the history and physical signs.

Rectal examination must be made in every case of sciatica. It is a simple and almost certain method of excluding pelvic neoplasm from the diagnosis.

Focal sepsis As previously mentioned, focal sepsis may aggravate a case of sciatica and impair the chance of successful treatment. It is as well, therefore, to examine the teeth tonsils, and sinuses. In severe cases, and particularly when operative treatment is being considered, the erythrocyte sedimentation rate should be determined. This factor may indicate concealed focal sepsis. Occasionally removal of a septic focus is followed by complete and permanent cure of the sciatica.

Lumbar puncture. The protein content of the cerebrospinal fluid is sometimes raised in cases of prolapsed intervertebral disc.

The cerebrospinal fluid was examined in 39 cases in which a prolapsed disc was subsequently found at operation. Only 13 of these presented an increased protein content. In most of them the elevation was moderate from 50 to 80 mgm. per cent. In 1 case the elevation was 200 mgm. per cent.

In 12 of the 15 cases in which the thickened ligamentum flavum was responsible for sciatica, the cerebrospinal fluid was examined. The protein content was raised in 6 of these.

So far as the question of a prolapsed disc is concerned, a raised protein content supports the diagnosis, but a normal result does not exclude it. We no longer perform this test as a routine procedure.

DIFFERENTIAL DIAGNOSIS

This is often difficult and sometimes impossible.

In the type of sciatica caused by lumbar fibrositis there is a history of one or more attacks of lumbago preceding or associated with the sciatic pain. There is widespread tenderness in the lower back. The lumbar spine may be moderately stiff but it is not deformed. There is no loss of motor power in the affected leg and no sensory loss. The ankle jerk is unaffected. Thus, in the typical case, there is no loss of conduction in the affected nerve.

Points may be present, but they are rare. A roentgenogram of the spine shows no significant

abnormality. Speaking generally fibrositis gives rise to many symptoms but few signs. In this type of case, particularly there is frequently a functional element which makes treatment unsatisfactory.

The diagnosis of spinal arthritis is suggested when the patient is over 40 years of age and has a stiff spine with spasm of the erector spinae muscles and a fixed lumbar lordosis. The roentgenogram may support the diagnosis. Signs of interference with conduction in the affected nerve roots may or may not be present. If the arthritic joints are producing referred pain there is no loss of conduction but a severe arthritis may provoke inflammatory changes around the root sufficient to interfere with conduction and produce abnormal neurological signs, usually of a minor degree (73). Differentiation between spinal arthritis and prolapsed disc may be impossible without an exploratory operation. Lumbar puncture may be done in doubtful cases. A raised protein content would favor the diagnosis of prolapsed disc, but it should be noted that according to Putti (73) the protein in the cerebrospinal fluid may be elevated in the neighborhood of an arthritic lateral joint.

Some cases of prolapsed disc and thickened ligamentum flavum are easily recognized. For instance, a young man develops sciatic pain soon after injury or strain of the back. On examination the lumbar spine is seen to be rigid and deformed. The normal lordosis has been lost the spine being either flat or kyphotic, and there may also be a lateral deviation, sciatic scoliosis. There is some wasting of the leg, some loss of muscle power and some sensory loss. The ankle jerk is absent. The roentgenogram may show narrowing of a disc space. The sciatica is caused by a prolapsed or degenerated intervertebral disc, by a hypertrophied ligamentum flavum, or by both.

In typical cases of this sort, it is not difficult to decide the diagnosis and advise appropriate treatment. Unfortunately there is a considerable number of patients with equivocal physical signs. A prolapsed disc or hypertrophied ligamentum flavum may produce signs which are not striking stiffness being only moderate and deformity absent, and there may be no interference with conduction in the nerve. The roentgenogram may give no assistance. The protein in the cerebrospinal fluid may be within normal limits. It is also to be noted that prolapsed discs may (rarely) occur in the middle-aged and elderly as well as in the young and that the history as regards injury is not a reliable guide.

Clearly there are ample possibilities of error in diagnosis. However there is usually some pointer

Laminectomy revealed neither a prolapsed disc nor a thickened ligamentum flavum. On opening of the dura the nerve roots of the cauda equina were matted together with a yellow exudate. (This was one of the cases in which the lipiodol had provoked a reaction.) There was also a misleading appearance of a filling defect.

The immediate result was that the patient was cured of all pain. A year later there was no pain at all. The patient said that his back felt weak. There was slight weakness of the peronei (right) also hypesthesia of the outer part of the dorsum of the right foot.

Case 3. Male, aged 33 years. For ten years, on and off he had had sciatica on the right side, which had become worse since he lifted a heavy weight 5 years ago.

The dorsal kyphosis had increased there was spasm of the erector spinae and flexion of the lumbar spine was limited, extension was limited and painful there was tenderness over the fourth and fifth lumbar spines, and over the right sacroiliac joint the Lasègue sign was positive on the right side at 40 degrees, the right calf was wasted there was hypesthesia to pin prick on the posterolateral aspect of the right thigh and outer part of the right calf vibration sense was absent over the right tibia, the postural sense of the right toes was impaired, the right ankle jerk was absent the roentgenogram showed no abnormality. The lateral joints were all in the coronal plane and therefore not clearly visualized.

Right hemilaminectomy was done. There was no abnormality of the intervertebral discs or the ligamentum flavum. A spinal arthrectomy was performed on the right side.

The immediate result showed much improvement with no pain, the sensory signs had disappeared.

Fifteen months later the patient was cured. There was no neurological abnormality and only occasional backache.

Case 4. Male, aged 30 years. He had had sciatica on the left side for 9 months.

The lumbar spine was stiff. There was tenderness over the third and fourth lumbar spines. The Lasègue sign was positive on the left at 50 degrees. There was marked loss of power in the dorsiflexors of the left foot. The protein content of the cerebrospinal fluid was 25 mgm. per cent. The roentgenogram showed anomalies of articular tropism. There was osteoarthritic lipping of the lumbar vertebrae.

Hemilaminectomy on the left side showed no abnormality of the intervertebral discs or ligamentum flavum. A spinal arthrectomy was done on the left side. (At operation the lateral joints on the left side appeared to be subluxated.)

The immediate result was a complete relief of pain. Later there was no sciatic pain but a little backache from time to time.

Evidently the intervertebral disc is not the only factor to be considered.

In Table II the diagnoses made in the 249 consecutive cases are shown. In this series, there were 129 cases with neurological abnormality. Table III shows the diagnoses made in this group. It will be seen that there were 54 cases in which the diagnosis was doubtful. It is the fashion now days to dispose of these cases by saying that they must all be protruded discs. This view is incorrect, as shown by the operations described previously.

Of the 54 cases undiagnosed, some, we may suppose were disc lesions others no doubt were

TABLE II — DIAGNOSES IN THE CONSECUTIVE SERIES OF 249 CASES

Fibrositis	94
Prolapsed disc	40
Lateral joint arthritis	41†
Ligamentum flavum	3
Ankylosing spondylitis	4
Spinal tumor	1
Spondylolisthesis	1
Diagnosis uncertain	65
Total	249

†Clinical diagnosis verified at operation in 5.

‡Diagnosis on roentgen findings.

caused by lateral joint arthritis, and there may also have been other factors not yet elucidated.

TREATMENT

Certain methods of treatment and the results obtained will now be described.

In an acute attack of sciatica the pain may be agonizing and may continue at this pitch for days and even weeks.

Palliative Treatment

1. Complete rest in bed. The patient is allowed to lie in whatever position he finds most comfortable. The long Liston splint, which is sometimes advised, does no good because the patient will not tolerate it when tightly applied and a loosely bandaged splint soon becomes merely an irritating appendage which prevents him from finding a comfortable position. Skin traction is also recommended by some writers. In my experience it gives no relief. The best plan is to support the patient with pillows in whatever position he obtains most relief from pain. Skillful nursing is obviously most important in this respect. A well sprung mattress should be provided.

2. Analgesic Drugs. For severe cases morphia will be required. When the pain becomes less intense, cachets containing pyramidon (gr 5) medinal (gr 3) and codain (gr 3/4) (Harris) are useful, and at a later stage aspirin and phenacetin may be used. Medinal (gr 7 1/2) may be given at night.

TABLE III — 129 CASES WITH LOSS OF CONDUCTION

Diagnosis proved by operation (Discs, lateral joint arthritis, ligamentum flavum, spinal tumor)	44
Diagnosed as disc protrusion but not operated upon	16
Diagnosed as lateral joint arthritis on roentgen findings	15
Remainder	54
Total	129

3. Local applications. The affected limb should be painted with liniment methyl salicylate, with glycerine and belladonna, or with lead and opium lotion, and wrapped loosely in cotton wool.

4. Radiant heat or diathermy may be applied daily. Massage should not be used. Light massage is useless, and deep massage is too painful.

5. Care of the bowels. This may be difficult. Aperients should be given if the patient is constipated. If the pain is severe, he will not be able to use a bed pan and will have to be lifted out of bed to a commode.

6. Oxygen injection into the affected limb, as described by Martin is a local measure which is useful in the acute and subacute stages of sciatica, although it is difficult to see why it should be so. It undoubtedly gives dramatic relief in many cases. The oxygen is bubbled slowly from a "Sparklet" containing 1 liter or from an ordinary oxygen cylinder with a fine adjustment valve, through warm water and it enters the thigh through a Record needle $\frac{1}{8}$ mm. in diameter which is introduced subcutaneously. Sterilized rubber tubing is used. The injection is continued until the thigh is moderately ballooned by the gas. If the pain returns, the injection may be repeated.

The treatment of chronic or recurrent sciatica is based as much as possible on the cause of the pain. In our series there were 15 cases which were thought to be due to fibrositis of the buttock and thigh. They were treated empirically by attention to focal sepsis, by physiotherapy by stretching the sciatic nerve, and by perineural injection of saline solution. These measures gave temporary relief but there were no cures. The symptoms persisted for months and in some cases for years.

Perineural injection. The surface marking of the exit of the sciatic nerve from the pelvis is at the junction of the middle and outer thirds of a line joining the posterior superior spine of the ilium with the tip of the great trochanter. This is also, as a rule, the point of maximum tenderness. In making a perineural injection, the needle is inserted at this point and is pushed gently in until it touches the sciatic nerve. The surgeon can tell when the sciatic nerve is reached by the twitching of the foot which is instantly provoked. When this occurs, the needle is withdrawn a little and from 80 to 100 c.c. of normal saline solution

to balloon the intermuscular spaces in which the nerve is lying and so to disrupt the adhesions around the nerve. Perineural injection is an uncertain method of treatment, but it is harmless and sometimes produces good results.

Stretching the nerve. While the patient is anesthetized, the sciatic nerve is stretched by flexion of the hip, the knee being held in full extension and the ankle in full dorsiflexion. The flexion of the hip should be forced as far as possible, short of dislocating the joint. "Adhesions" may be heard to give way in the thigh during this maneuver.

For sciatica caused by lumbar fibrositis, rest, physiotherapy, and attention to focal sepsis are the first steps in treatment. For severe or moderately severe cases, complete rest in bed should be insisted upon. If the pain still persists, an epidural injection should be tried and this may be combined with manipulation of the spine.

Sciatica caused by spinal arthritis, prolapsed intervertebral disc, or thickened ligamentum flavum is treated first of all by rest. The patient is confined to bed for 3 or 4 weeks. If during this time there is significant improvement this conservative line of treatment is continued, and in some cases proves successful.

Case 1. Male, aged 46 years. He had very severe left sciatica for 6 months.

The lumbar spine strongly indicated disc lesion. There was marked kyphosis and list to the right. The spine was very stiff.

The Lasègue sign was positive on the left side at 70 degrees. There was marked wasting of the left thigh and calf and general weakness of the left leg. There was sensory loss. The left ankle jerk was absent. The protein content of the cerebrospinal fluid was 120 mgm. per cent. The roentgenogram showed no significant abnormality.

With complete rest in bed the patient rapidly improved. He was kept in bed for 3 months. The pain disappeared. Eighteen months later he wrote me saying that he had no sciatic pain. His back felt weak, but he had been able to resume his work as a bank clerk and had been able to work in his garden in his spare time.

This was almost certainly a prolapsed disc.

Case 2. Male, aged 52 years. Six months before his first attendance he fell heavily on both buttocks and subsequently had persistent lumbar backache, which after 3 or 4 months began to radiate into the back of the right thigh and calf. When first seen, 3 years ago, he had severe right sciatica.

no spontaneous pain. Slight aching pain in the lower back and in the back of the right thigh occurred after exercise. The Lasègue sign was negative on both sides. There were no abnormal neurological signs.

This sciatica was probably caused by arthritis of the lateral joints.

It is advisable to give rest a trial, even in cases with physical signs of an intraspinal lesion. Operation should be considered only after prolonged rest in bed has been tried and has failed, unless the presence of severe symptoms forces the surgeon's hand. The tedium of the stay in bed is beguiled daily with physiotherapy and the usual clinical, laboratory and x-ray investigations are performed without undue haste, over a period of 2 or 3 weeks. By this time it will be possible to decide whether continued rest is likely to produce an improvement. Some patients improve up to the point where by a careful regime, avoiding exposure and excessive strain, they can be kept fairly comfortable and fit for business.

In some cases, pain disappears suddenly. For instance one of our patients with chronic sciatica suddenly became free from pain as she was stepping out of her bath one morning. She said she felt that something had moved in her back.

Sudden improvement may occur because the nerve root involved has moved into a position less exposed to pressure, or the protruding part of the disc may have separated completely and moved away from the root on which it was pressing. This had happened in 1 of our cases, in which a fragment the size of a pea was found completely detached, in the epidural space, over the body of the fifth lumbar vertebra.

If rest produces no significant improvement epidural injection, combined in some cases with manipulation of the spine is the next line of treatment. If the pain still persists, the question of operation arises, and will be decided by the age and general condition of the patient, his occupation, and the degree of disability. For some individuals a spinal support is the best treatment.

Epidural injection. Pentothal anesthesia is used. The patient lies on his side. The cornua of the sacrum are identified and the posterior surface of the coccyx palpated below them. A Labat's needle is inserted horizontally between the cornua and directed headward and slightly forward. The needle will enter the canal of the sacrum without any difficulty. It is pushed in for about an inch. With a Labat's 20 c.c. syringe with a two-way attachment, a large volume of normal saline solution, previously warmed to blood heat, is injected. As a rough guide 250 c.c. are taken as the correct volume. It is necessary to use a large volume because the fluid acts mechanically. As the injection

proceeds it fills first the sacral canal, and then is forced upward into the lumbar canal outside of the dura. As more fluid is injected and the pressure inside the canal increases, the fluid escapes laterally through the intervertebral foramina and in doing so it disrupts any adhesions which have formed around the nerve roots, e.g. in association with arthritic changes in the lateral joints. That is the supposed rationale of the injection. Sometimes there is ocular proof that the fluid has in fact escaped through the intervertebral foramina, as a swelling appears under the erector spinae muscle on one or both sides. A considerable degree of force is necessary to impel the fluid up the canal and the injection is usually a laborious and tedious business. Morphine may be required the first few hours after the injection.

There are two possible errors in making this injection. The needle may be put in too near the surface and so lie on the posterior aspect of the sacrum instead of inside of it. The operator will detect this error at once because the first syringe-full will produce a swelling over the sacrum. The second error is to push the needle in too far so that it enters the dural sac. This will not happen if the needle is inserted only 1 inch.

This injection is worth trying because it is harmless and sometimes produces a dramatic and lasting cure. Some diagnostic importance has been claimed for the epidural injection in that it is said to cause an exacerbation of the pain from a prolapsed intervertebral disc. We have not found this to be the case.

Manipulation of the spine is performed under pentothal anesthesia. If combined with epidural injection it should be done first, while the relaxation is complete. The method described by Bankart is used.

There are four movements to be carried out namely

1 **Flexion.** The surgeon stands on the right hand side of the supine patient, and places his right arm under the patient's knees. He lifts the legs up flexing the hips and knees, and carries the knees upward until they are pressed on the patient's chest. The fullest possible flexion of the lumbar spine is thus obtained.

2 **Rotation to the left.** The patient lies on his right side. The left leg hangs over the side of the table, and the left arm is placed behind the patient's back. The surgeon leans with his right forearm on the left iliac crest, while with his left hand he grasps the left shoulder. A forcible rotatory movement of the sacroiliac joint is produced by pulling the iliac crest forward and pushing the shoulder backward.



Fig. 18. Lines of bone section for the operation of spinal arthrectomy

3. Rotation to the right. The surgeon goes to the other side of the table and the patient is turned on to his left side. The maneuver described above is repeated.

4. Extension. The patient is turned on to his face. With his left arm the surgeon lifts the patient's legs until they are almost vertical, and with his right hand presses downward over the lumbar spine, extending it as much as possible.

The manipulation is followed by a course of spinal exercises, radiant heat and deep massage.

Most patients with sciatica have stiff spines, and manipulation of the spine as an empirical method of treatment was much employed when prolapsed intervertebral discs were less frequently diagnosed. It is now in disfavor because it has been said that manipulation may make an unsuspected prolapse worse, and perhaps even precipitate a paraplegia. We have never seen any ill result from the operation and have heard of only one, in a patient who developed sensory loss in the leg and foot immediately after a manipulation of the spine (Dick, 1943). Friberg has shown experimentally that the most powerful flexion or extension of the lumbar spine has no effect on artificially produced prolapses. The risks of manipulation are evidently small. We still think it is worth trying a manipulation, except in those cases which have the typical signs of a prolapsed disc.

Operative Treatment of Sciatica

The operations to be considered are spinal arthrectomy and laminectomy. (We have seen 5 cases in which Ober's (66) operation had been per-

formed elsewhere. The result in each case was unsatisfactory.)

Spinal Arthrectomy This operation was mentioned by Putti (73). It has been elaborated and extensively used by Bankart.

The steps of the operation are as follows (Figs. 18, 19, 20).

1. A midline incision is made over the lower 3 lumbar spines and the upper part of the sacrum.

2. With a sharp chisel, the erector spinae muscles on each side are reflected from the spinous processes, throughout the length of the incision.

3. On the affected side, the reflection is continued laterally until the lateral joints L 3 and 4, L 4 and 5 and L 5 and S 1 are exposed. The end of a Bristow elevator is placed on the outer side of each joint to act as a landmark and retractor. These joints are dealt with separately in the following manner.

4. The inferior articular process of the upper vertebra is isolated by cutting through the lamina with an osteotome or with Lane's gouge forceps.

5. This articular process is removed with Lane's gouge forceps.

6. The base of the superior articular process of the lower vertebra is cut through with an osteotome.

7. This articular process is removed with Lane's gouge forceps.

What is the principle of the arthrectomy operation? How does it work? It was originally designed to cure sciatica by removing the lateral joints, on the assumption that these arthritic joints were causing sciatic pain. But clearly there are other



Fig. 19.

Fig. 19. Spine after spinal arthrectomy. The joints between L4 and 5 and L5 and S1 on the right side have been removed. The black cord represents the fourth nerve root.



Fig. 20.

Fig. 20. Roentgenogram taken 4 years after spinal arthrectomy on the right side.

effects of arthrectomy. Every arthrectomy is necessarily also a hemilaminectomy. The lateral parts of the laminae and ligamentum flavum are excised, in addition to the lateral joints. The effect of this is to remove the posterior wall of the spinal canal on the affected side and also the posterior wall of the intervertebral foramen. If the diagnosis is mistaken and the sciatica is really caused not by spinal arthritis, but by a protruded disc (a lateral protrusion especially) or by hypertrophy of the ligamentum flavum, the environment of the nerve root may yet be altered sufficiently to produce a cure. In this connection it should be noted that the first step of the arthrectomy operation is an exposure of the laminae. It is a good plan to expose the corresponding disc at this stage. It is easily done by removing the ligamentum flavum and exploring the interlaminar space. If an abnormal disc is found this can be dealt with. If the discs are normal the arthrectomy is completed.

Laminectomy. In the modern operation for prolapsed disc only the necessary minimum of bone is removed, but I prefer to make a wide exposure and remove a considerable amount of bone on each side of the interspace. This allows a full view of the disc and nerve root and permits the surgeon to see clearly what he is doing. It also gives the nerve root a margin of safety from subsequent compression by a recurrent protrusion or by scar tissue. (In 1 of our patients [not included in the

present series] a protrusion was removed from the fourth disc through a narrow exposure, only a tiny portion of bone being removed from the lamina of the fourth lumbar vertebra. The pain, never completely relieved, soon returned and became worse than it had been before the operation. At the second operation 6 weeks after the first the only abnormality found was a dense mass of scar tissue which had formed around the fourth lumbar root. This was dissected out and bone was removed widely on both sides of the interspace. This relieved the pain completely.)

For laminectomy the patient lies on his side with the affected side uppermost.

1. A midline incision is made from the lower border of the third lumbar spinous process to the second sacral spinous process.

2. With a sharp chisel the erector spinae muscles are reflected on both sides. Packing is done at the same time.

3. The packing is removed and further dissection is done to expose the laminae and the ligamentum flavum.

4. The spinous process of the fifth lumbar vertebra is excised.

5. The ligamentum flavum between the fifth lumbar and first sacral vertebrae is excised. On the affected side particularly the lateral part of the ligament which sometimes extends far outward and is in contact with the issuing nerve root (fifth lumbar) is dissected.

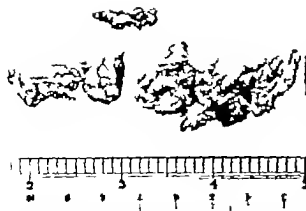


Fig. 2. Portion of intervertebral disc removed at the second operation in a case of sciatica. At the first operation a large protrusion of the fifth disc was found and a piece of disc material the size of a small cherry was removed. This operation gave complete relief from pain but the sciatica recurred after a year. At the second operation the material shown above was removed. This operation relieved sciatic pain, but backache persisted.

6. The interlaminar space is enlarged with Lane's gouge forceps, the bone being taken away in small bits from the contiguous margins of the fifth lumbar and first sacral laminae, until free access to the dura is obtained.

7. By blunt dissection and gentle swabbing with cotton wool pledgets, the dura and the fifth lumbar nerve root are exposed and cleansed, the nerve root will be seen coursing inside its dural sheath to the intervertebral foramen.

8. With a blunt hook, the root is gently retracted outward, and the theca is gently pushed inward with a Macdonald's respiratory.

9. The floor of the canal, so exposed, is explored for a protrusion. If a protrusion appears, the overlying posterior ligament is incised and the loose portions of the disc are removed. When all that is loose has come away the surgeon should be satisfied. Nothing is gained by curettage or removal of the remainder of the disc. Removal of a prolapsed disc should mean removal of the loose portions only. Only the part that is loose should be removed, and no more.

10. Occasionally a midline protrusion can be felt, but it will not be properly exposed, by the steps described. In such cases, the dura should be opened. The protrusion is then excised transdually.

11. If nothing is found at the fifth interspace, the fourth interspace should be explored and if that is also normal, the third interspace should be explored. (The vast majority of protrusions occur at either the fourth or fifth interspace.)

Operation for concealed disc and degenerated disc without protrusion. We have referred already to the cases in which only a tiny protrusion (concealed disc) or a degenerated disc, not protruding, is found. There is clearly no question of relieving pressure on a nerve root, since no root is being pressed upon. If removal of disc tissue is attempted, it may be found that there is a little shaggy fibrous tissue in the superficial layers, but there is no loose material. In such cases we do not remove any material from the disc. I do not believe that biting out the disc tissue with a punch serves any useful purpose. Therefore, when the nature of the lesion has been verified, the incision is closed.

The results, immediate and remote, are less satisfactory in these cases of concealed disc than in those in which there is a definite protrusion. Relief from pain is slower and less complete. This is an important consideration in selecting cases for operation.

In the operation for a concealed disc a wide exposure, with ample resection of bone, is a valuable precaution, since a protrusion may occur subsequently if the degeneration of the disc progresses.

RESULTS OF TREATMENT

Follow up proved to be difficult and is incomplete. Due to war time difficulties many patients could not be traced.

The military cases were (with the exception of certain operative cases) excluded from the review of the results of treatment. Comparison of the results in civilian life with those in Service patients is seldom valid. The remaining cases totalled 206, as follows:

Cases treated by physiotherapy alone	19
Cases treated by manipulation of the spine and stretching of the nerve	25
Cases treated by epidural injection	37
Cases treated by open operation.	125
Total	206

1. Results of physiotherapy (19 cases). The average duration of attendance was 30 weeks. On follow up 3 years later 6 patients were symptomless, 6 still had pain, and 7 could not be traced.

2. Results of manipulation of the spine and stretching of nerve (25 cases). The average duration of attendance was 25 weeks (the manipulation being followed by physiotherapy).

There were no quick cures but most patients derived subjective benefit from the manipulation.

On follow-up 3 years later 5 patients were symptomless, 6 still had pain, and 14 could not be traced.

REVIEWS OF NEW BOOKS

BECAUSE the author of *Postgraduate Obstetrics* has had extensive experience as a teacher of postgraduate courses this book is distinctly authoritative. He has attempted to discuss only subjects which should be of interest to the average family doctor based on the statistical frequency of obstetric complications.

The chapter dealing with the toxemias of pregnancy is admirably presented and it emphasizes the conservative attitude of nearly all obstetricians as regards the treatment of eclampsia. However one does not agree with the author's statement that it is justifiable to state didactically that eclampsia *reverts to a contraindication to cesarean section* (author's italics). In rare instances a cesarean section under direct infiltration anesthesia is a cesarean section under presence of eclampsia.

In the section on the acute infectious diseases, such unusual diseases as scarlet fever, measles, German measles, and malaria are discussed during the first three months of gestation is omitted. One has less faith than Mengert in cytography as an aid in the diagnosis of placenta previa. Many believe that the Braxton Hicks version which is described as one form of treatment of placenta previa should be given up entirely because it is a dangerous procedure even for specialists. On the other hand contrary to the author one believes that a cesarean section is indicated in all cases of total placenta previa, even if the baby is not viable or is dead, so as to prevent maternal death or injury.

One agrees that premature artificial rupture of the membranes represents the safest method of induction of labor provided the proper conditions are present but it is doubtful that when pituitary extract is used for induction as much as 6 gms can be used as one done with impunity. Rupture of the uterus has followed even 1 minum doses given for induction of labor. In the section dealing with uterine inertia Mengert properly warns that the use of more than 3 minum doses imposes intolerable maternal and fetal risks. In the discussion on postpartum hemorrhage one believes two recommendations should be omitted namely the use of the Credé maneuver even if bleeding is not checked by oxytocic drugs and the use of intravaginal douches. There may be a question as to whether it is proper in a book on postgraduate obstetrics to include a detailed chapter on sterility including the matters of adoption of a baby and artificial insemination. Minor criticisms are the frequent use of the word "pituitrin" a trade name, instead of the term "posterior pituitary extract" and the secondary position (in parentheses) assigned to the metric system. The use of the metric system in dealing with medical subjects conforms with practically all foreign medical literature and many representative American journals.

In spite of suggested differences of opinion this book is a valuable contribution. It covers all the obstetric subjects with which general practitioners must be familiar. It is well written by one of the foremost obstetricians, it contains sound, practical advice and it has numerous instructive illustrations most of which are beautiful drawings by Ruth Maxwell Sanders. The book has been printed on paper of good quality the type is clear and the illustrations have been well reproduced.

J P GREENTHILL

THE monograph *Penicillin in Neurology* devotes approximately one-half of its text to basic studies describing the dispersion and absorption of penicillin when injected intrathecally and to the effect of this drug upon normal nervous tissue. Four of ten chapters are concerned with penicillin therapy in meningitis in infections of the skull and brain, in diseases of the spinal cord and its coverings, and in syphilis of the central nervous system. A final chapter recounts briefly the relation of antibiotics other than penicillin to the normal and diseased central nervous system. Selected references 311 in total number are appended to each chapter. The authors may be considered as authorities since they were among the first if not the first, to report certain noxious influences of penicillin upon the intact and infected brain. These clinical observations have been followed by a series of lengthy and critical experimental investigations.

The textual material and the well chosen illustrations and charts, largely a summation of the authors own experiences combine to form a scholarly description of the biophysics of penicillin. The discussion of penicillin therapy suffer only from the usual need of terminating a modern monograph at some definite publication date and from the obvious fact that antibiotic therapy is a matter of daily occurrence. This deficiency is most noticeable in the chapter devoted to streptomycin, streptothricin, actinomycin, and clavacin.

The wisdom of including a chapter upon the value of penicillin in syphilis is open to the contention that this might be evaluated more clearly by contrast to other methods of therapy detailed in a specialized text upon syphilis. Neurologists and neurosurgeons should be very content with this monograph, however and make this edition and future editions mandatory reading for their students.

BARNES WOODMALL

PENICILLIN IN NEUROLOGY. By A. Earl Walker, M.D. and Herbert C. Johnson, M.D. Springfield, Illinois: Charles C. Thomas, 1946.

POSTGRADUATE OBSTETRICS. By William F. Mengert, M.D. New York and London: Paul B. Hoeber Inc., 1947

3. Results of epidural injection. This was often combined with manipulation of the spine and was usually followed by physiotherapy.

In 14 cases with no neurological abnormality the average duration of attendance was 16 weeks.

In 1 of these cases there was complete relief of pain after the injection.

Most of the patients obtained considerable but not complete relief.

On follow up 3 years later 3 patients were symptomless, 6 still had pain and 5 could not be traced.

In 23 cases with abnormal neurological signs the average duration of attendance was 12 weeks.

Immediate results 9 patients were cured, 8 were benefited, 4 were not benefited, and for 2 no record was available.

On follow up 3 years later 12 patients were symptomless, 6 still had pain, and 5 could not be traced.

In 3 of the patients without symptoms the abnormal neurological signs and the spinal deformity and stiffness had disappeared.

Thus, altogether there were 37 cases treated by epidural injection, and in 10 there was immediate and lasting relief of pain.

On follow up of these 37 cases 3 years later, 15 of the patients were symptomless, 12 still had pain, and 10 could not be traced.

The results of epidural injections are noticeably better in the group with abnormal neurological signs, as might be expected. Epidural injection is certainly worth a trial as it is harmless, it nearly always gives some relief and in a proportion of cases it produces a complete cure.

4. Results of operation (125 cases) There were 55 arthroplasties and 70 laminectomies.

Arthroplasties (55 cases) Detailed records of the state of the lateral joints excised in these operations are not available. In some cases there was gross arthritis in some there was subluxation of one or more joints in a proportion there was no macroscopical abnormality.

Immediate results 39 patients were completely cured, 3 were benefited and 13 patients were not benefited.

Of the 39 cured patients 25 remained symptomless, 10 had recurrence and 4 could not be traced.

Three of the patients with recurrence subsequently had an exploratory laminectomy because the pain persisted. In all 3 a thickened ligamentum flavum was removed.

The results of these 3 operations showed that 1 patient was cured 1 was benefited, and 1 had no benefit whatsoever.



Fig. 22. Roentgenograms of the case referred to in Figure 21. The preoperative roentgenogram was normal. The first operation was performed in 1941 and the second in 1943. Note progressive narrowing of the disc.

In 2 cases the recurrence was on the opposite side. In 1 of these a further arthroectomy on that side was performed which cured the recurrence.

Follow up of the 3 patients who were benefited showed that 1 was cured, 1 was still having pain and 1 could not be traced.

Follow up of the 13 patients on whom the operation was a failure showed that 1 had recovered, 1 was cured by subsequent spinal fusion, 1 was cured by injection of the nerve, 1 was cured by removal of the ligamentum flavum 6 were still having pain, and 3 could not be traced.

Thus, of the 55 patients, at the follow up 2 to 3 years later 30 were symptomless (5 of these having had other treatment since the arthroectomy) 17 still had pain, and 8 could not be traced.

A complete and lasting cure, apparently attributable to the arthroectomy was obtained in 25 of the 55 cases.

Laminectomy (70 cases) The operative findings were as follows

a. Abnormal intervertebral disc with or without associated thickening of the ligamentum flavum (40 cases)

b. Thickening of ligamentum flavum (no prolapse of disc) (14 cases)

c. No pathology discovered in disc or ligamentum flavum (15 cases)

d. Spondylolisthesis (1 case)

a. Abnormal intervertebral disc (40 cases) civilian (23 cases) and military (17 cases)

The immediate results in the civilian case showed that 21 patients were cured 1 patient was benefited, and 1 was not benefited.

malignant neurogenic melanoma, arising from the Schwann cell and the nerve cell (a) benign and malignant neurogenic melanopithelioma, from the pigment epithelium of the retina and ciliary body (3) leiomyoma, from the dilator and sphincter muscles of the iris, (4) dictyoma, from the pigment epithelium of the iris (5) precancerous and cancerous melanosis from the basal layer of epithelium and (6) benign and malignant chromatogenic melanoma derived from the mesodermal chromatoblasts (uvea, sacral and extracanal meibomian spots)

JOSEF A. ZUCKERMAN M.D.

Roper Hall, M. J.: Research in Zurich. *Brit J Ophth.*, 1947 3 23.

This article gives a summary of the work on the pathological changes in the aqueous humor and the blood-aqueous barrier carried on at Zurich. The specimen of aqueous was obtained with a special needle attached to a tuberculin syringe which enters the anterior chamber on a plane parallel to the iris and at a point about 3 mm from the limbus. A smear and culture were first taken from the conjunctival sac and a small scraping of corneal endothelium was removed from the point at which the puncture was to be made.

On the 0.5 c.c. of fluid obtained a study was carried out, including quantitative tests for albumin (Pandy reaction) cell count, cultures, and microscopic examination of the centrifuged material with various stains. The conjunctival and epithelial smears were examined and conjunctival cultures were correlated with the aqueous findings. More than 1,000 punctures were performed in the course of this research. The following findings were noted:

1. The normal aqueous contains from 0 to 1 cell per cubic millimeter.

2. The number of cells increases in cases of anterior uveitis and deep corneal ulcer usually to between 30 and 200 cells, but in a few cases up to 100,000 cells per cubic millimeter.

3. In acute inflammations the albumin is increased in proportion to the number of cells.

4. In chronic inflammations there is a dissociation between the albumin and the cell count as observed in the pathology of the cerebrospinal fluid.

5. Study of the morphology and origin of the cells indicates that the cells are derived from the blood and neighboring tissues.

6. The presence of microphages and macrophages in the specimens indicates the phagocytic and antitoxic function of the desquamated cells.

7. Of the 651 cases of endogenous and exogenous iridocyclitis, keratitis and panophthalmitis, 19 per cent showed large reticuloendothelial cells which had phagocytized micro-organisms, thought to be staphylococci in most cases. Tubercle bacilli were found in only 1 case. Cultures are rarely positive (30 cases in the series).

8. The presence of micro-organisms in the anterior chamber in cases of iritis and keratitis may throw light on the etiology.

9. The absence of tubercle bacilli may throw some doubt on the importance of their role in the etiology of uveitis.

10. The type of organism found indicates the possibility of focal infections.

Studies on the blood-aqueous barrier were carried out with the intravenous injection of fluorescein and studies of the aqueous with an adapted slit lamp. Investigation of 200 normal eyes showed that there is a regular and gradual rise of fluorescein in the anterior chamber with the normal for children slightly higher than that for adults. After examining 1,000 cases by this method it was concluded:

1. In iridocyclitis there is an increase in permeability which corresponds to the severity of the disease.

2. In glaucoma there may be a normal or considerable increase in permeability perhaps indicating the etiology.

3. Ocular affections and trauma cause an increase in permeability, as well as some general diseases such as chronic nephritis, hepatitis, and especially diabetes.

4. Pilocarpine increases the permeability atropine has no effect, and adrenalin decreases it.

Studies of the Tyndall effect suggest that it shows the permeability of the damaged blood-aqueous barrier to proteins and large molecules, while the fluorescein permeability shows the more minute change in the wall to small particles.

WILLIAM A. MANN, M.D.

EAR

Mohe, F. E.: Chemosurgical Treatment of Cancer of the Ear; A Microscopically Controlled Method of Excision. *Surgery* 947: 605.

This article deals with the chemosurgical treatment of cancer of the ear and includes an analysis of the therapeutic results in a consecutive series of 107 lesions treated over a period of 9.5 years. Inasmuch as the behavior of squamous cell carcinoma is much different from that of basal cell carcinoma, the two histologic types are considered separately except in regard to the chemosurgical technique which is the same for both types.

The chemosurgical technique by which cancer of the ear may be excised under systematic microscopic control is described in detail.

The rates of cure in the series of patients with squamous cell carcinoma of the ear were 80 per cent at 6 months or more, 74.3 per cent at 3 years or more, and 64.3 per cent at 5 years or more. The primary lesion was eradicated in 92 per cent of the patients.

The rates of cure in the series of 55 patients with basal cell carcinoma of the ear were 92.3 per cent at 6 months or more, 87.1 per cent at 3 years or more, and 81 per cent at 5 years or more.

The reliability and the conservatism of the method are both due to the systematic microscopic control of excision afforded by the chemosurgical technique.

JOHN F. DELANEY, M.D.

NOSE AND SINUSES

Spar, Arthur A.; and Hallberg, Olav E.: Severe Epistaxis and Its Management; Report of 11 Cases in Which the External Carotid Artery was Ligated. *Ann Otol Rhinol.*, 1947 56 142

Since 1930 106 cases of epistaxis have been treated in hospitals connected with the Mayo Clinic. Of all the patients studied approximately 40 per cent had either hypertension or arteriosclerosis or both, which had been previously diagnosed. Forty per cent of all the patients were more than 60 years of age. Of those past 60 years 60 per cent had hypertension. In 29 cases presenting no obvious cause of hemorrhage or previous diagnosis of cardiovascular disease the epistaxis was classified as of undetermined cause. In nearly all of these however the patients were in the age group in which cardiovascular disease is common.

Most textbooks dismiss the anterior portion of the septum as being of only nuisance value, but half of the total number of these patients requiring hospitalization bled from this source. It is not surprising to those who routinely have to treat nosebleed that anterior septal bleeding can be so severe as to require hospital apparatus for its control. Three of 5 patients more than 60 years of age bled from this source.

Nearly a third of all patients bled from a point high and posterior in the nose, most of these from the sphenopalatine artery. Trauma incidental to packing the nose prior to hospitalization was found to be a considerable factor in the cases classified as bleeding from the turbinates or diffusely from the nasal membranes.

On admission to the hospital the patient is examined first for symptoms of shock and for active bleeding. If he is an adult he is given from $\frac{1}{4}$ to $\frac{1}{2}$ gr (from 0.01 to 0.06 gm.) of morphine by hypodermic injection. With close observation of the patient it is not difficult to distinguish between shock due to hemorrhage and the shocklike appearance of a patient who is nauseated from swallowing too much blood. If there is uncertainty as to the condition of the patient there need be no hesitancy in giving him a transfusion of blood. Liters of group O blood should be available for immediate use.

If the hemorrhage is controlled by packs inserted elsewhere prior to hospitalization the packs are left in place and the patient is watched thereafter for recurrence of bleeding.

If there is active bleeding, all packs are removed and the nose is quickly cleaned with a suction apparatus under direct vision to determine the source and severity of the bleeding. Cotton pledgets moistened in equal parts of a 1:1,000 solution of ephedrine chloride and a 10 per cent solution of cocaine are then used to shrink the nasal mucous membrane and provide local anesthesia for any necessary instrumentation. A length of 1 inch (2.5 cm.) gauze heavily covered with vaselin is probably the most useful agent available to the rhinol-

ogist for the control of nasal hemorrhage. Large spurting vessels do not respond to the chemical cautery and high posterior spurting vessels are inaccessible to the electrocoagulating point. A short strip of vaselin gauze, carefully and firmly packed over the bleeding point controlled hemorrhage in 80 of the cases of nosebleed.

There should be no hesitancy about inserting a postnasal pack if the anterior packing alone fails to stop the flow of blood. Chemoprophylaxis or antibiotics are routinely used in cases in which posterior packing is required.

Eleven patients failed to respond to conservative treatment and required ligation of the external carotid artery. Two of these developed minor wound infections and a third needed tracheotomy because of laryngeal edema from wound infection.

MOUTH

Oscar Ernesto Martins: The Mirault Blair Brown Operation on the Unilateral Harelip (The Flap Operation) (La operación de Mirault Blair Brown en el labio leporino unilateral). *Boletín Soc. Cir. Córdoba*, 1946, 7 436.

Types of unilateral harelip include (1) partial when the mucous membrane and border and adjacent skin only are involved (2) subtotal, when the cutaneous part of the lip is involved and (3) total, when the entire lip, nasal passages, and the gingival arch are affected.

Good surgical results must obtain the following: (1) symmetrical overhanging ala (2) symmetry of the nasal passage and columella (3) a satisfactory base for the nose (4) maintenance of normal curvature of the nose (5) a precise columella, (6) normal curvature of the upper lip and (7) even and properly proportioned mucosal and vermilion borders.

Steps of the subtotal and total harelip operations are given in detail with the cardinal points emphasized and illustrated.

The authors advocate surgical repair within the first 48 hours as the complications of the malformation are more easily avoided. Postoperative management must be assiduous. Nonabsorbable sutures are removed in from 4 to 6 days. Food is given from the first hours according to the patient's tolerance. Local anesthesia is preferred although some workers use ether.

STEPHEN A. ZIEGLER, M.D.

Seeley R. C.: Maxillofacial Injuries. Reconstructive Surgery of the Dehiscent Parotid Duct and Dehiscent Peripheral Facial Nerve. *Am J Surg* 1947 73 551.

The purpose of this article is fourfold: to bring up to date the work done on parotid duct injuries; to review the literature to the date on the associated facial nerve injuries; to report a case and to present a logical surgical technique in the repair of maxillofacial injuries resulting in lacerations, obstructions, or dehiscences of the peripheral facial nerve and parotid duct.

One of the least commonly stressed injuries about the face is parotid duct injury particularly when the injury results in the dehiscence of the duct. Such an injury would necessarily be predicated upon a similar injury to the peripheral facial nerve. This article deals primarily with the secondary repair of the dehiscence of the parotid duct, dehiscence of the buccal branch of the facial nerve and repair of the buccal branch. The technique employed is one that can be utilized in either primary or secondary repairs.

In retroseptal duct injuries have for the most part been considered quite separately with regard to methods of repair and these usually have been emphasized under two headings: (1) the immediate repair, and (2) repair of the duct with existing fistula. With reference to the seventh nerve peripheral injuries, these too have been considered for the most part as separate entities notably by Furstenberg and Bunnell.

It is the contention of the author that, while many cases of separate injury of the duct and facial nerve exist in consequence of injuries of a type, it is more than likely that if parotid duct injury exists peripheral nerve injury is also present and vice versa. If a lacerating, penetrating or avulsion injury involves the parotid duct the buccal and zygomatic branches of the facial nerve will be involved.

The author believes that it is not necessary to convert external fistulas into internal fistulas as a method of repair and that it is practicable to explore, isolate, resect, and anastomose by primary suture as a method. That is better surgery in view of the nerve factors present. The author's case, after pathological resection and excision 45 days subsequent to the primary injury was successfully repaired despite the existence of a 30 mm. dehiscence of the duct proper and a 30 mm. dehiscence of the zygomatic branch of the facial nerve. An indwelling No. 30 alloy steel wire dowel, which can be carried out through the cheek with no residual evidence of a puncture wound externally is a dowel of new material which is unsurpassed in reducing capillary and surface tension factors.

The successful repair in the case presented should nullify the opinions of those who elect to extirpate the parotid gland or destroy it by radiation when obstruction or fistulas exist. JOHN F. DILLON, M.D.

Friedman, G. A.: Tracheotomy in Maxillofacial Surgery. *Surgery* 1947 755.

Severe maxillofacial wounds are often associated with other injuries and associated neck injury is especially important in this connection. Three questions must be answered: How much can be done? How shall it be done? How best can it be done?

The causes for acute respiratory obstruction such as hemorrhage into the air passages, edema of the aryepiglottic fold, and foreign bodies, are enumerated as well as the signs of acute respiratory obstruction.

In war surgery the primary concern is indication for tracheotomy when respiratory obstruction is not

yet present but diagnosis leads one to believe that it will ensue.

Among the causes are injuries to the base of the tongue, pharynx or larynx, with or without the presence of foreign bodies, large foreign bodies in the air passages which cannot be removed under direct vision, extensive soft tissue wounds of the face which may cause later destruction by the spread of inflammation to the mucous membranes of the air passages, extensive fractures of the mandible situated where the tongue cannot be held forward by mechanical means, extensive injury to the upper facial regions, especially when these close off the nasal passage completely, and severe fractures of several of the upper facial elements.

Postoperative inflammation may descend to involve the pharynx and subsequently the mucous membranes of the air passages. Injury to the recurrent laryngeal or the vagus nerve by direct trauma or by pressure from hemorrhage may cause paralysis of both cords if bilateral and extreme dyspnea may ensue.

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Among other conclusions, the author states that horizontal incision of the skin is the natural and best one for tracheotomy. JOHN F. DILLON, M.D.

NECK

Lahay, Frank H., and Bartels, Elmer C.: The Use of Thiouracil, Thiobarbital, and Propylthiouracil in Patients with Hyperthyroidism. *Ann. Surg.* 1947 15 572.

The authors prepared 660 patients for surgery with thiouracil, thiobarbital or propylthiouracil during a 3 1/2 year period. In addition, 27 cases were treated over a long period of time without surgery. These compounds in adequate dose prevent synthesis of inorganic iodine into diiodotyrosine and thyroxine; the protein bound iodine decreases and the basal metabolism rate drops. In time myxedema may result. The microscopic appearance of the hyperplastic gland is not changed by these agents. The metabolic rate returns to normal with adequate dosage. The usual daily doses required are 600 mgm. of thiouracil, 50 mgm. of thiobarbital or 300 mgm. of propylthiouracil. (The original suggested dose, from 75 to 125 mgm. of propylthiouracil, has been found too small.) With the above doses, the basal metabolism rate decreases 1.3 per day in patients having primary hyperthyroidism for less than 9 months, without iodine therapy. If iodine has been taken, or if hyperthyroidism has been present longer than a year irrespective of iodine, the daily decrease in the basal metabolism rate is 1.2. With toxic adenomas, especially if iodine has been given, the decrease may be as slow as 0.5 daily. The longest time required was 180 days. The incidence of complications was 28 per cent with thiobarbital, 9 per cent with thiouracil and 3 per cent with propylthiouracil. With propylthiouracil and with thiobarbital, only

cried and sobbed together. In succeeding months he became absorbed in the mysticism of the Bible, and, as "Ambassador of God," importuned the Pope for another crusade to free the Holy Sepulchre from the infidels. His sense of persecution grew stronger and stronger. If this was tertiary syphilis, it would indicate a more rapid progression than usual, for it was only about eight years since the first voyage on which the primary infection may be said to have occurred. However this would coincide with the rapid action of the spirochete in a member of a completely non-immunized group. Diagnosis is difficult, because of the chaotic mass of controversial material, but a detached historical spirit recognizes that, apart from the ophthalmia and the rheumatoid arthritis, syphilis would account for all of his symptoms, both in their nature and in the relative times of their occurrence. To explain them otherwise means considering a list of single and distinct pathological conditions, including relapsing fever, typhus or typhoid, rheumatic fever and valvular heart disease, followed by paranoia.

In the spring of 1502 Columbus began his fourth and last "farewell tour" of America. He wanted to find a strait through which he might sail west into Portuguese Asia. During most of the voyage he was too sick to leave his cabin. Cardiac dropsey added to the pains of arthritis made his life miserable enough without the hardships of exploration. Poor food and bad weather plagued his little fleet. Storms wrenched and strained his crazy worm-eaten ships as they wandered painfully among the keys and shoals he had named the Garden of the Queen. Mutiny blazed up in his crews. Shipwreck ran him aground on Jamaica, where the Nani-like conduct of his men started the first American Revolution. Only his ability to foretell an eclipse of the moon saved him and them from the revenge of the superstitious natives.

Arriving in Spain two years later he was so ill that he had to be carried ashore. Meanwhile friend Isabella had died of an intestinal tumor untreated because she was too modest to allow herself to be examined. Her scamp of a husband, Ferdinand, always hostile, was of no help to the

discoverer of Spain a new empire. Poor Columbus lived in misery attempting to follow the court on its interminable peregrinations. Unable to endure the jittery paces of the Andalusian horses, he was forced to hoist his swollen legs on mule-back or be carried in litters.

Valladolid lies in a cleft among barren, treeless mountains, a city drowning away the hours in its silent convents and dusty streets. There, heart sick and weary Columbus dragged himself after the court for the last time. There he lingered painfully until May of 1506 when his diseased heart valves finally played themselves out. He handed over into the hands of God his proud, courageous spirit,

A battered, wrecked old man,
Thrown on this savage shore, far far from home
Pent by the sea and dark rebellious brows
My terminus near
The clouds already closing in upon me,
The voyage balk'd, the course disputed, lost,
I yield my ships to Thee

Walt Whitman.

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blood cell depression and fever have been observed with thiouracil there were white blood cell depression, fever, skin rash, swollen salivary glands, edema of the skin and 1 death with agranulocytosis. The authors believe the use of thiobarbital should be abandoned.

In managing their patients, the authors require a white blood count every 10 to 14 days. When the white cells decrease below 4,500 and when the granulocytes are below 45 per cent administration of the drug is stopped or continued very cautiously. Treatment of agranulocytosis requires the use of penicillin to prevent or cure infection, which is the cause of death. No benefit from pyridoxine or liver extract was seen in these patients. The penicillin is given intramuscularly and by throat spray.

Because of the increased vascularity and friability of the gland resulting from simple thiouracil, thiobarbital or propylthiouracil treatment with resulting difficulty in the surgical removal of the gland iodine is now given from the beginning of treatment and administration of the thiocompound is stopped 7 days before surgery. The 7 day period was chosen because agranulocytosis has been observed as late as 7 days after cessation of drug administration. This avoids agranulocytosis as a complication at the time of operation.

Iodine therapy is not used in patients with adenomatous goiters.

Surgery should be done with the patient in as nearly normal a state of metabolism as possible. If myxedema occurs before surgery there is danger of too great edema of the larynx and of too great sensitivity of the respiratory center to morphine. Tracheotomy had to be used once in such a situation.

There were 115 thyrocardiac patients and 26 diabetics among the 660 patients treated with thiocompounds. The new treatment has reduced the previous surgical mortality of 6.7 per cent among thyrocardiac patients to 0.87 per cent. The 1 fatality among the thyrocardiacs was the only death among the 660 cases, an over-all mortality of 0.15 per cent. A variety of complicating diseases were present, including recurring gallstone colic and thrombocytopenia. The thyroid condition was treated first then the complication.

An attempt was made to treat primary hyperthyroidism by medical means alone in 21 cases. Treatment varied from 2 to 20 months before remission occurred. After the thiouracil was stopped, 13 of the 21 cases presented a relapse. All of the 8 patients still in remission had mild cases. The authors believe that severe cases will always require surgery, but that there is still a basis for hope that mild cases may be cured or permanently controlled by medical means.

CLINTON H. THIESS, M.D.

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The authors attempted to prevent hyperplasia of the thyroid with thiouracil as they thought there was

some danger of promoting cancerous change especially since invasive tumors in animals have been produced by simultaneous administration of thiouracil and a carcinogen. Since thiouracil hyperplasia is believed to be due to an increased secretion of pituitary thyrotropin which in turn is due to the decreased amount of thyroxin in the circulation the author gave 64 mgm. of desiccated thyroid along with 0.6 gm. of thiouracil to 6 patients with exophthalmic goiter. The preoperative course was similar to that in patients given thiouracil and iodine. There was satisfactory involution of the gland with accumulation of colloid. The vascularity in 3 of the cases was equal to that in thiouracil iodine treated patients and in 3 was thought to be slightly greater.

The author believes that desiccated thyroid is a satisfactory adjunct to thiouracil for preoperative preparation of thyrotoxic patients.

CLINTON H. THIESS, M.D.

Morgana, M. E.: Toxic Effects of Thiourea, Thiouracil, Methyl Thiouracil and Aminothiazole in Thyrotoxicosis. *Lancet* Lond 1947 1 519.

A series of 92 patients with thyrotoxicosis were treated with thiourea (7), thiouracil (49), methyl thiouracil (3) and aminothiazole (13) to determine the toxic effects of these drugs during the initial phases of treatment.

A table is presented in which the effect of these 4 thiourea drugs on the granular cells during the first 3 weeks of treatment is shown. The greatest decrease occurred at the end of the first week and in the methyl thiouracil series. With aminothiazole the granular cell count was halved during the first 3 weeks and in 38 per cent of the cases the absolute granular cell count was lowered more than 1,000 per cubic millimeter from initial levels.

A comprehensive incidence of complications is shown in a table for these drugs and the dosage used during the first 2 months of treatment. Methyl thiouracil and thiouracil produce a decrease of the white cells and in some cases leucopenia but the incidence of other dosage effects is very low. From the author's point of view thiourea and aminothiazole have many toxic effects and their clinical use is no longer justifiable.

RICHARD J. BRODIE, JR., M.D.

Williams, R. H., Asper, S. P., Jr., Rogers, W. F., Jr., Myers, J. D. and Lloyd, C. W.: Persistence of Remissions of Thyrotoxicosis after Cessation of Thiouracil Therapy. *N. England J. Med.* 1947 336 737.

Of 111 thyrotoxic patients who were treated with thiouracil and had a cessation of therapy 51 are in remissions that have lasted for 3 to 31 months. Forty four patients have been free of thyrotoxicosis for more than a year after cessation of therapy and 33 have remained well for more than 18 months. Of all the patients who remained well without treatment for more than a year only 1 had a relapse. Following the cessation of treatment with thiouracil, most of

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In retrospect, duct injuries have, for the most part been considered quite separately with regard to methods of repair and these usually have been emphasized under two headings: (1) the immediate repair, and (2) repair of the duct with existing fistulas. With reference to the seventh nerve peripheral injuries, these, too have been considered for the most part as separate entities, notably by Furstenberg and Bunnell.

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NOTE

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A series of 92 patients with thyrotoxicosis were treated with thiourea (7), thiouracil (49), methyl thiouracil (23) and aminothiazole (13) to determine the toxic effects of these drugs during the initial phases of treatment.

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RICHARD J. BENNETT JR., M.D.

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Of 111 thyrotoxic patients who were treated with thiouracil and had a cessation of therapy 51 are in remissions that have lasted for 3 to 31 months. Forty four patients have been free of thyrotoxicosis for more than a year after cessation of therapy and 33 have remained well for more than 18 months. Of all the patients who remained well without treatment for more than a year only 1 had a relapse. Following the cessation of treatment with thiouracil most of

the patients who had a relapse had it within a few months, 70 per cent had it within 3 months, and 88 per cent within 5 months.

Factors that have tended to favor persistent remissions were as follows: female sex, small goiter and a mild degree of thyrotoxicosis. The age of the patient, the duration of the disease, and the nodularity of the thyroid gland were not found to exert a significant influence, but these factors may prove important when larger series of cases are analyzed.

The good effects obtained with thiouracil encourage the frequent use of its less toxic derivatives, 6-propylthiouracil in the treatment of thyrotoxicosis. This therapy, radioactive iodine, or a combination of the two, appears to offer the most satisfactory method of treating the majority of patients with thyrotoxicosis, but further experience may reveal complications from these types of treatment that are of greater magnitude than are anticipated at present. Therefore, patients treated by these newer methods must be followed carefully.

Arceot, J., and Wolf, A.: The Vallecular Sign: Its Diagnosis and Its Clinical Significance. *Am. J. Roent.* 1947 57 435.

The "vallecular sign" consists of the retention of barium mixture during the swallowing act in the pockets of the valleculae and in the pyriform sinuses. The findings have been such that they might be taken as a differential diagnostic sign pointing to organic disease. This sign has been observed in bulbar paralysis, myasthenia gravis, carcinoma of the cardiac end of the stomach, carcinoma of the hypopharynx, suspected paramedasternal lung tumor perforating carcinoma of the esophagus, and a case of abnormal origin of the right subclavian artery with clinical symptoms of dysphagia lusoria.

Eight cases are presented in detail along with 17 figures. The presence of the "vallecular sign" points to an organic lesion and not to a functional type of dysphagia. RICHARD J. BERKETT, JR., M.D.

Leahy, Frank H.: Parathyroid Tumors. *Surg. Clin. N. America*, 1947 27 477.

There are four types of parathyroid tumors: (1) discrete nonhyperfunctioning adenomas of the parathyroid; (2) cystic degeneration within such an adenoma producing a cyst of the parathyroid; (3) hyperfunctioning parathyroid adenoma; and (4) localized malignancy in the neck arising from a parathyroid gland.

In patients with clinical signs of hyperparathyroidism on whom an operative procedure must be performed to discover the hyperfunctioning parathyroid adenoma, it is of the utmost importance to be familiar with the appearance and probable location of the normal glands. In most cases 4 parathyroid glands are present, 2 at the upper and 2 at the lower pole. The glands at the upper pole are usually situated at the point where the upper lobes of the thyroid rest against the larynx, in relation particularly to the horn of the thyroid cartilage. To demonstrate these

glands it is usually necessary to ligate the superior thyroid artery and roll the superior pole of the thyroid downward and inward. The inferior parathyroids are more difficult to demonstrate; their frequent location within the branches of the inferior thyroid artery and vein makes the necessary bloodless dissection difficult. Also at this location fat as well as lymphoid and thymic tissue can easily be confused with parathyroid tissue.

Anomalous positions of the glands are quite common. Parathyroid glands have been found on the anterior surface of the thyroid within the substance of the thyroid gland, beneath the clavicle and in the mediastinum. The normal parathyroids vary in size from structures not much larger than the head of a match up to those the size of a pea or bean. They usually have a distinctive light mahogany yellowish brown color. Another distinctive feature of the parathyroid glands is their flat disklike shape. In the presence of a hyperfunctioning adenoma the remaining normal glands may be quite inactive; such glands are filled with fat, are pale in color and do not look like normal parathyroids. In the event that the hyperfunctioning adenoma is not readily found, it is of great value (if possible) to identify the 3 normal glands in order to have definite indications as to the location of the adenoma. It must not be forgotten that on occasion the hyperfunctioning adenoma is within the substance of the thyroid gland.

The diagnosis of hyperparathyroidism, when it is present in a well developed state, is not difficult; the presence of varying degrees of decalcification of the bony skeleton, and the typical blood chemistry changes of high calcium, low phosphorus, and high phosphatase blood values are diagnostic. However, the diagnosis of hyperparathyroidism should not be delayed until pronounced decalcification has taken place. Any evidence of bone rarefaction, spontaneous fracture, and kidney stones should arouse suspicion of this disease. Calcium excretion in the urine can be simply estimated by means of the Sulkowitch test: 2 c.c. of acid urine are mixed with an equal amount of Sulkowitch reagent and the turbidity read qualitatively.

Attention is called to the danger of tetany following the surgical removal of a hyperfunctioning adenoma. Also while recalcification is progressing during the postoperative period orthopedic support in proper positions may be necessary so that the recalcification does not exaggerate the positions of deformity. F. J. LAMARCA, JR., M.D.

Goldberg, H. M.: Carotid Body Tumors. *Bull. J. Surg.* 1947 34-793.

Two detailed case reports of rare carotid body tumors with survival and without complications after ligation of the common carotid artery are presented. A review of the subject is discussed.

The carotid body is inconstant in man and when present is situated behind the common carotid artery at its bifurcation.

Extirpation or absence of the carotid bodies has no adverse effect.

Tumors constitute the only pathological lesion of the carotid body. About 265 cases have so far been reported. They are slow growing tumors, usually benign at first, but they may become malignant later.

The majority of tumors arise from the epithelial type of cell. Two patterns, the alveolar and the peritheliomatous, have been described.

Tumors of the carotid body occur with equal frequency in both sexes. Both sides are equally affected. The average age of the patients is 43 years.

The most frequent history is that of a painless unilateral slow growing tumor in the neck. Rarely the tumor is sensitive to touch, but it is never painful. Other symptoms are due to compression or invasion of the surrounding structures. These are not frequently encountered. Hoarseness, dyspnea, dysphagia, cough and tinnitus may be due to compression of the vagus. Horner's syndrome, due to pressure on the cervical sympathetic, and carache due to involvement of the cervical plexus have been reported. Fainting attacks are due to the coexistence of a sensitive carotid sinus.

Overactivity of the carotid sinus reflex has been associated with a carotid body tumor in 5 of 260 cases found in the literature and in 1 case of the author's. The nerve supply of the sinus is similar to that of the carotid body being derived chiefly from the glossopharyngeal nerve by way of the carotid sinus nerve of Hering and probably also from the vagus, hypoglossal and the sympathetic nerve. A tumor of the carotid body may therefore, occasionally produce an overactive sinus by 2 mechanisms, either by direct pressure or by way of a reflex arc. Other lesions in the neighborhood of the bifurcation of the common carotid, such as cervical lymphadenopathies (chiefly tuberculous) are very occasionally associated with a hypersensitive sinus.

Carotid sinus syncope can be precipitated in subjects with a sensitive sinus by a sudden turning of the head wearing tight collars, or by pressure over the sinus. It is characterized by pallor, hyperpnea, muscular twitching and dizziness followed by unconsciousness. Flushing of the face occurs on recovery. Two types of carotid sinus syncope are recognized according to which of the 2 efferent pathways, the vagus or the vasomotor depressor nerves, predominates.

In the cardioinhibitory type in which vagal cardiac inhibition is the predominant factor a marked fall in the blood pressure is associated with complete asystole or ventricular standstill. The electrocardiogram during the attack shows no alteration of potential or only a succession of P waves. This reaction can often be prevented by atropine.

In the vasoconstrictor type vasodilatation causes a fall in the blood pressure and the consequent cerebral anemia results in unconsciousness. The cardiac rate does not slow markedly and vagal stimulation of the heart produces at the most nodal escape so that the electrocardiogram shows either no alteration from normal or absent P waves.

This type may often be relieved by sympathomimetic drugs such as ephedrine or benzedrine.

The electroencephalogram shows moderate to high voltage slow (delta) waves during unconsciousness. This is an unspecific response and can be seen in syncope from various causes such as venous puncture and distension of the colon and rectum.

A third type has been described, in which syncope is unassociated with any significant alteration in the blood pressure or cardiac rate. This has been called the cerebral type but its existence is doubtful.

The tumors are ovoid or round in shape situated at the bifurcation of the common carotid artery and lying partly under the sternomastoid (elevating the anterior border of that muscle) and partly in front of it. The surface is smooth or finely lobulated. The consistency is firm resembling the texture of a fibrotic tuberculous gland. Lying within the carotid sheath firmly attached to the artery they can be moved from side to side but not vertically. On account of their vascularity they can be temporarily reduced by pressure. Compression of the common carotid artery also temporarily reduces their size. Transmitted pulsation can always be elicited. A few tumors present a bruit and thrill. A sensitive carotid sinus, if present on the same side as the tumor will give rise to the typical attacks on pressure on the tumor for about 30 seconds. The pharyngeal wall is occasionally displaced by the tumor and physical signs due to pressure on the surrounding nerves are found occasionally.

The correct preoperative diagnosis has only been made in 25 of 180 tumors. The most common erroneous diagnoses are tuberculous glands, branchial cyst, aneurysm, and lateral aberrant thyroid tumor. Secondary malignant glands, branchial carcinoma, neurofibroma, lymphadenoma, and lymphosarcoma must also be considered. A punch biopsy has been suggested but has been thought dangerous by most workers on account of the vascularity of the carotid body tumor. Even biopsy can be misleading.

The criteria on which to base the diagnosis of carotid body tumors are:

1. A history extending over several years of a slow growing painless tumor in the neck.
2. A firm oval tumor in the region of the bifurcation of the common carotid.
3. Free lateral but very limited or no vertical mobility.
4. Decrease in size on compression of the common carotid artery.
5. Transmitted but no expansile pulsation.

The prognosis depends on whether the common carotid has to be ligated and whether invasion has occurred before operation. The operative mortality is 15 per cent without ligation and 30 per cent when the artery has been tied.

The age of the patient and the duration of the condition are not a guide as to whether malignancy has supervened. More rapid growth and horizontal fixation may be taken as an indication of malignancy.

nancy. Usually it is only at operation when difficulty is encountered in shelling out the tumor that the invasive character is manifest. Nor is age an infallible indication whether hemiplegia may occur after division of the common carotid. The youngest patient with a carotid body tumor in whom ligation of the common carotid resulted in hemiplegia was 26 years old.

Radiotherapy does not appear to have any effect on carotid body tumors. The ideal treatment is total removal of the tumor without carotid ligation.

Hemiplegia may come on immediately after operation when it is due to deficient collateral circulation of the cerebral hemisphere, or it may be delayed for 24 hours or longer when it may be due to occlusion of the middle cerebral artery by ascending thromboses. The hemiplegia may be permanent, but often it is only transitory and leaves very little final disability.

An electroencephalogram after compression of the common carotid for from 30 to 60 minutes is the best indication of the competence of the collateral circulation, although it does not exclude the danger of delayed hemiplegia. If the electroencephalographic studies show a deficient collateral circulation and during the course of the operation it becomes obvious that the tumor is inseparable from the vessels, it may be wiser to abandon the operation and to rely on what little help x rays can give.

In order to lessen the incidence of hemiplegia manual carotid compression for periods up to 30 minutes for 2 to 3 weeks before operation has been advised. The efficiency of the procedure has not yet been proved. This could be done by a series of electroencephalogram studies. Mechanical devices to close the carotid gradually have been used; a clamp which can be tightened daily; metal bands and others.

A general anesthetic has been used in most cases as the operation tends to be a long one. The incision should be generous and should run either along the skin creases or along the anterior border of the sternomastoid muscle. The platysma is divided as well and the flaps raised to beyond the borders of the tumor. The deep fascia is incised along the anterior border of the sternomastoid and the muscle retracted posteriorly. The carotid sheath is now opened below the tumor; the common carotid isolated and a ligature put around it; the ligature is not tied. This is a safeguard in case the artery is torn during the dissection. The internal jugular vein is either stretched across the tumor or pushed backward and is usually divided. The vagus and sympathetic lie behind the tumor in the carotid sheath and must be carefully preserved. The superior laryngeal nerve of the vagus may be divided if it gets in the way. The hypoglossal nerve should be kept out of harm's way as it runs forward medial to the upper pole of the tumor. The tumor is freed from the surrounding structures on all sides. It can be rotated from side to side to put all adherent

structures on the stretch. An attempt should be made to dissect it off the arteries. If the vessels are not completely encircled this should be done by sharp dissection, but if they are completely surrounded it is recommended that an artery forceps be inserted along the vessel from below and dividing the overlying tissues between clamps, much as one would separate the thyroid isthmus from the trachea. It is during this procedure that the vessel is most likely to be torn. If the vessel has to be tied it should be transfixed at the same time. The tumor can now be pulled upward to expose the vagus in its bed and dissection proceeds from below upward. The internal and external carotid arteries are then tied and transfixed and the tumor is removed. The skin and platysma are sutured; a small drain being left at the lower end of the wound.

Following ligation of the common carotid the patient should be kept in the Trendelenburg position for 10 days and not allowed up for another 2 to 3 weeks. This minimizes the danger of cerebral anemia, which is the most common postoperative complication, giving rise to hemiplegia, aphasia, facial palsy and unconsciousness. Deviation of the tongue would follow hypoglossal injury and vocal cord paralysis would follow damage to the recurrent laryngeal nerve.

JOHN E. KARASIN, M.D.

Marshall, Samuel F., and Miles, George O.: Tumors of the Submandibular and Parotid Gland Areas. *Surg. Clin. N. America*, 1947, 27, 301.

This report is based on a study of 150 tumors of the parotid and submaxillary regions. Similar tumors may also arise from the oral cavity, nasopharynx, accessory nasal sinuses, lacrimal gland and middle ear. When present in these locations the tumors arise from the mucous glands of the area. There were 24 cases of cancer of the salivary gland in this series, 4 of which were of lymphoblastic origin. Parotitis is the most common nonneoplastic swelling confused with parotid neoplasia. A small tumor of only a few weeks' duration should be sewed with suspicion. Parotitis is usually tender to palpation, a most important differential diagnostic point but if the inflammatory process has become chronic the tenderness may disappear. Angiomas, sebaceous cysts, branchial cleft cysts, and hyperplastic adenitis must also be considered in the differential diagnosis.

In these cases 99 of the patients were females and 5 were males. The average time elapsing before operation was 10.6 years. Frequently with malignant growths a history of rapid enlargement was obtained. Only 2 patients with parotid carcinoma noted paralysis before they discovered a tumor. On physical examination, fixation of the tumor is the most presumptive physical sign of carcinoma. The author does not agree with the statement that small tumors are more likely to recur after operation than large ones. The two major considerations in the operative procedure are to remove a liberal margin of normal salivary gland to avoid recurrence, and to avoid

injury of the facial nerve. To accomplish this the authors isolate and identify the nerve in all cases except those with the most superficially located tumors. Of 13 patients with benign parotid or submaxillary tumors who had no previous surgery, 2 (15%) had a subsequent recurrence. Of 10 with parotid or submaxillary carcinoma, 9 (90%) had a subsequent recurrence. Epidermoid cancer and adenocarcinoma in general give a less favorable prognosis than malignant mixed tumors.

When a decision has to be made during operation between sacrificing the main trunk of the nerve and accomplishing an unsatisfactory excision the opinion of a pathologist as to the type of tumor may indicate removal of the nerve. Otherwise the authors make every effort not to enter the tumor bed. There is a great difference in morbidity in cutting the lower and upper divisions of the main nerve trunk. The authors do not hesitate to cut the mandibular branch of the facial nerve for benign disease if necessary nor do they hesitate to sacrifice any part of the nerve in cases of carcinoma if the nerve definitely traverses the tumor.

The authors strongly recommend isolation of the main trunk of the nerve in all but the most superficial benign parotid tumors. They isolate the nerve as it exits from the stylomastoid foramen and by careful dissection follow it forward. Before the actual isolation of the nerve is accomplished the external maxillary artery is identified and ligated which markedly reduces bleeding in the operative area. The nerve itself leaves the stylomastoid foramen 1 or 2 cm. medial to the lateral surface of the mastoid process and 1 cm. superior to its tip.

F J LEXEMANN JR. M D

Ruzicka, Edwin R., and Eversole, Urban H.: The Management of Anesthesia for Surgery of the Neck. *Surg Clin N America*, 1947 27 517

Of fundamental importance in the administration of anesthesia, particularly in cases of neck surgery, is the maintenance of a clear airway. Endotracheal tubes are often indicated. The author advises against the routine use of blind intubation by the nasotracheal route. Profuse nasal hemorrhage may be a serious complication. Fluids should be administered through a leg vein.

General anesthesia is recommended in all cases of thyroid surgery. Cyclopropane has the serious disadvantage of increasing the irritability of the heart muscle and should probably not be used on thyrotoxic patients. The endotracheal tube should be used when there is deviation or compression of the trachea, cancer of the thyroid, intrathoracic extension of the tumor paralyzes either or both vocal cords, and for all secondary operations. If there is marked encroachment on the airways by the thyroid tumor

or if preoperative stridor is present the endotracheal tube should be placed in position under topical anesthesia before a general anesthetic is administered.

When surgery is being performed for esophageal diverticulum no oral preoperative medication should be given because of the possibility that the medication may enter the diverticulum and thus exert no effect. An endotracheal tube with an inflatable cuff should always be employed to prevent aspiration. Laryngoscopy, bronchoscopy and esophagoscopy may be performed under sodium pentothal and curare anesthesia.

Laryngectomy presents a problem in the maintenance of an airway. If a tracheotomy has been previously established the tracheotomy tube can be removed under pentothal anesthesia and a metal endotracheal tube with an inflatable rubber cuff may then be placed in the trachea. An excellent airway is thereby maintained. If a tracheotomy has not been done previously the orotracheal tube is used in the usual manner until the larynx is excised and the tube is then inserted into the tracheotomy opening. Patients with bilateral vocal cord paralysis often need emergency endotracheal intubation and this can best be done under topical anesthesia.

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The authors relate the case history of a woman 33 years of age who had a squamous cell carcinoma arising on the anterior wall of the cervical esophagus immediately adjacent to the larynx. To insure adequate removal of the tumor it was necessary to remove the larynx, cervical trachea, base of the tongue, the hypopharynx, and the cervical esophagus together with the cervical chain of lymph nodes on each side.

Reconstruction of the esophagus was begun at the initial operation by creating half a cutaneous tube or gutter from the oropharynx to the transected esophagus by use of a skin flap from the neck. At a second operation 10 weeks later the other half of the cutaneous tube was fashioned by raising a skin flap again from the side of the neck. Dermatoe grafts and pinch grafts were used to epithelize the raw surfaces.

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EDWARD H. CAMP M D

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Marshall, Samuel F. and Miles, George O.: Tumors of the Submaxillary and Parotid Gland Areas. *Surg. Clin. N. America*, 1947, 7, 59.

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EDWARD H. CAMP, M.D.

SURGERY OF THE NERVOUS SYSTEM

BRAIN AND ITS COVERINGS; CRANIAL NERVES

Davis, Loyal; and Perrat, George: Cerebral Thromboangiitis Obliterans. *Brit. J. Surg.* 1947 24 307

Eleven cases of cerebral thromboangiitis obliterans are presented with signs and symptoms similar to those produced by a slowly growing intracranial tumor. Only 3 of the patients had evidence of peripheral circulatory disturbances. In 9 of the 11 cases with a similar clinical picture an osteoplastic craniotomy was performed. The gross and microscopic changes in the cerebral vessels are described and the changes are illustrated in several photographs made at the time of operation. The anatomical diagnosis is made by the presence of the characteristic small, white, wormlike obliterated vessels, the granular atrophy of the cortex, and the presence of thrombi associated with proliferation of the endothelial cells of the intimal and subintimal layers of the vessels.

The clinical diagnosis is more difficult. Cerebral thromboangiitis obliterans occurs most commonly in people between the ages of 30 and 50. Most symptoms are transient in the beginning, come in attacks, and recede completely. The history is usually of long duration and is characterized by unilateral sensory disturbances followed by weakness and sensory paralysis. Speech disturbances and visual field defects were also common.

Air studies were performed in 6 cases and the predominant findings were cerebral atrophy with enlargement of the ventricular system and subarachnoid spaces. Arteriography was not performed in any of the cases.

An excellent bibliography and review of the literature is given. The purely cerebral form was first described by Foerster and Guttmann in 1933. It is frequently diagnosed as lues, juvenile arteriosclerosis, hypertension, atypical multiple sclerosis, or an intracranial tumor. The condition is not as rare as might be expected and may very well be responsible for many organic cerebral changes which are not clearly diagnosed and which masquerade under the name of other diseases. HOWARD H. LAMSTER, M.D.

McNickle, H. F.: The Surgical Treatment of Hydrocephalus. *Brit. J. Surg.* 1947 24 303.

The author describes a method of performing third ventriculostomy for the surgical relief of hydrocephalus. Briefly the method is to puncture the floor of the third ventricle by means of a hollow needle passed from above into a lateral ventricle, directed through the foramen of Monro into the third ventricle by touch or by telescope, and advanced to its destination under the x-ray screen.

Four cases of noncommunicating hydrocephalus and 3 cases of communicating hydrocephalus were treated and the results presented. The author be-

lieves that the division of hydrocephalus into communicating and noncommunicating types is an arbitrary one and has been overemphasized. He also states that cauterization of the choroid plexus seems to be wrong in principle. Floating debris after the operation must sometimes aggravate the hydrocephalus.

Included also is a discussion of the cause of hydrocephalus. The rationale of third ventriculostomy is given, and suggestions are made for the prevention and treatment of the type of hydrocephalus associated with lumbar myelomeningocele.

HOWARD H. LAMSTER, M.D.

SPINAL CORD AND ITS COVERINGS

Barr, Joseph S.: Ruptured Intervertebral Disc and Sciatic Pain. *J. Bone Surg.* 1947 29: 439.

In 1934, Mixter and Barr drew attention to the syndrome of the protruding intervertebral disc and since that time the subject has been of considerable interest to neurosurgeons and orthopedic surgeons throughout the world. It is fitting, therefore, that one of the co-authors of that original paper should now summarize his views on the subject of the development of the syndrome and the various aspects of it which are of interest to all those who have to deal with this condition.

In the present article the author reviews the end-results obtained in patients treated for ruptured disc in the years 1939 to 1943, inclusive. The study comprises 134 cases—103 with spinal fusion and 31 with out spinal fusion. Some of the patients were sent a questionnaire to be filled out; others reported for re-examination and re-evaluation. The questionnaire goes into sufficient detail to bring out the points that are of interest in the end-result. Of particular interest is the comparison of improvement in patients with, and in patients without spinal fusion. The tables are set up in such a way as to show the differences between these two types of treatment by placing the statistical studies side by side. The results of the questionnaire show a slight but definite superiority of the result obtained with fusion over the result obtained without fusion when all types of complaints and disabilities are considered. There was one death from massive pulmonary embolism 17 days following the operation of spinal fusion.

In a series of 24 compensation cases, 60 per cent of the patients had absolutely no complaint and 71 per cent were back at full duty. It is pointed out that some of the poor results in compensation cases are due to improper treatment and neglect, mental and physical deterioration, poor operative technique, and unnecessary weakening of the architecture of the spine; also, there are conditions still diagnosed as ruptured disc in spite of negative exploration. Many compensation cases are those of laborers whose work

REVIEWS OF NEW BOOKS

BECAUSE the author of *Postgraduate Obstetrics*¹ has had extensive experience as a teacher of postgraduate courses, this book is distinctly authoritative. He has attempted to discuss only subjects which should be of interest to the average family doctor based on the statistical frequency of obstetric complications.

The chapter dealing with the toxemias of pregnancy is admirably presented and it emphasizes the conservative attitude of nearly all obstetricians as regards the treatment of eclampsia. However one does not agree with the author's statement that "it is justifiable to state didactically that eclampsia represents a contraindication to cesarean section" (author's italics). In rare instances a cesarean section under direct infiltration anesthesia is justifiable in the presence of eclampsia.

In the section on the acute infectious diseases such unusual diseases in pregnancy as small pox, scarlet fever, measles and malaria are discussed. German measles, which is important because of its harmful effects on the fetus *in utero* when it occurs during the first three months of gestation is omitted. One has less faith than Mengert in cystography as an aid in the diagnosis of placenta previa. Many believe that the Braxton Hicks version which is described as one form of treatment of placenta previa should be given up entirely because it is a dangerous procedure even for specialists. On the other hand, contrary to the author one believes that a cesarean section is indicated in all cases of total placenta previa, even if the baby is not viable or is dead, so as to prevent maternal death or injury.

One agrees that premature artificial rupture of the membranes represents the safest method of induction of labor provided the proper conditions are present but it is doubtful that when pituitary extract is used for induction as much as 6 minims can be used as one dose with impunity. Rupture of the uterus has followed even 1 minim doses given for induction of labor. In the section dealing with uterine inertia, Mengert properly warns that the use of more than 2 minim doses imposes intolerable maternal and fetal risks. In the discussion on postpartum hemorrhage one believes two recommendations should be omitted namely the use of the Credé maneuver even if bleeding is not checked by oxytocic drugs and the use of intrauterine douches. There may be a question as to whether it is proper in a book on postgraduate obstetrics to include a detailed chapter on sterility including the matters of adoption of a baby and artificial insemination. Minor criticisms are the frequent use of the word "pituitrin," a trade name instead of the term "posterior pituitary extract" and the secondary position (in parentheses) assigned to the metric system. The use of the metric system in deal-

ing with medical subjects conforms with practically all foreign medical literature and many representative American journals.

In spite of suggested differences of opinion this book is a valuable contribution. It covers all the obstetric subjects with which general practitioners must be familiar; it is well written by one of the foremost obstetricians; it contains sound practical advice and it has numerous instructive illustrations most of which are beautiful drawings by Ruth Maxwell Sanders. The book has been printed on paper of good quality, the type is clear and the illustrations have been well reproduced.

J. P. GREENHILL.

THE monograph *Penicillin in Neurology*² devotes approximately one-half of its text to basic studies describing the dispersion and absorption of penicillin when injected intrathecally and to the effect of this drug upon normal nervous tissue. Four of ten chapters are concerned with penicillin therapy in meningitis, in infections of the skull and brain, in diseases of the spinal cord and its coverings, and in syphilis of the central nervous system. A final chapter recounts briefly the relation of antibiotics other than penicillin to the normal and diseased central nervous system. Selected references 311 in total number are appended to each chapter. The authors may be considered as authorities since they were among the first, if not the first, to report certain noxious influences of penicillin upon the intact and infected brain. These clinical observations have been followed by a series of lengthy and critical experimental investigations.

The textual material and the well chosen illustrations and charts, largely a summation of the authors' own experiences, combine to form a scholarly description of the biophysiology of penicillin. The discussions of penicillin therapy suffer only from the usual need of terminating a modern monograph at some definite publication date and from the obvious fact that antibiotic therapy is a matter of daily accruing data. This deficiency is most noticeable in the chapter devoted to streptomycin, streptothricin, actinomycin, and clavacin.

The wisdom of including a chapter upon the value of penicillin in syphilis is open to the contention that this might be evaluated more clearly by contrast to other methods of therapy detailed in a specialized text upon syphilis. Neurologists and neurosurgeons should be very content with this monograph however and make this edition and future editions mandatory reading for their students.

BARNES WOODHALL.

¹POSTGRADUATE OBSTETRICS. By William F. Mengert, M.D. New York and London: Paul B. Hoeber Inc., 1947.

²PENICILLIN IN NEUROLOGY. By A. Earl Walker, M.D. and Herbert C. Johnson, M.D. Springfield, Illinois: Charles C. Thomas, 1944.

involves considerable back strain. It is pointed out that one cannot expect to return these patients to work for at least 6 months.

The author reports his experiences at the United States Naval Hospital, Bethesda Maryland. Prior to his arrival the neurosurgeons were removing discs without spinal fusion but they were glad to co-operate with him in performing fusion in a great many if not most, of the cases observed after his arrival at that institution. The enlisted personnel however, following the operation of removal of discs and spinal fusions were not considered suitable for full duty as this involved twisting and lifting.

The technique of fusion employed by the author is that previously described by Bosworth and consists essentially of a clothes-pin graft taken from the ilium. Myelography was used routinely in these cases with removal of the pantopaque. A conservative preliminary attitude is recommended for at least a period of 6 weeks as an operation of this magnitude is not considered to be without risk. The author believes that the best trend of treatment is towards removal of the disc and fusion of the spine. Views are expressed on related details associated with the diagnosis and treatment of the ruptured intervertebral disc with sciatic pain.

ADAMSON VON BROGGERN, M.D.

Lenhard, Raymond E.: End Result Study of the Intervertebral Disc. *J Bone Surg* 1947 29 445

The author presents a condensed four page statistical study of the end results obtained by Walter Dandy in the treatment of the intervertebral disc. Eight hundred and forty three patients were operated upon during the period from 1911 to 1944 inclusive, and in March 1945 questionnaires were sent out. Five hundred and thirteen or 60 per cent of the patients, returned the questionnaire and 147 patients returned for examination. These formed the basis of the study.

There were three phases of development of the treatment carried out in these cases. Before January 1913 the loose fragments were removed. During the period between January 1913 and January 1913 a curettage or removal of the entire disc was carried out. After June 1913 multiple discs were recognized and removed completely. The third procedure produced the best results.

Examination of the 147 patients revealed good results in 67.5 per cent of the patients. Improvement in 17 per cent, and no improvement in 15.5 per cent of the patients. Of the 513 patients replying to the questionnaire (not examined) good results were obtained in 59.5 per cent, improvement in 22.0 per cent and no improvement in 17.6 per cent. A few of the patients were entirely relieved of symptoms and were able to perform their normal duties without complaint. In none of these patients was fusion accomplished according to any orthopedic standard. Among the 147 patients who returned for examination, 20 had had multiple operations, 16 had had 2 operations, 2 had had 3 operations and 2 patients had had 4 operations.

Pantopaque studies were not used routinely as in 90 per cent of the patients the lesion was said to have occurred at the fourth and fifth lumbar vertebrae. There was no distinct relationship between the narrowed space and the faulty disc. The author points out that prior to 1913 Dandy doubted the frequency of occurrence of ruptured disc, but after he had seen many cases he became convinced that all low back pain with or without sciatic pain was caused by injury or abnormality of the intervertebral discs.

ADAMSON VON BROGGERN, M.D.

Livingstone, R. G., and Leach, J. E. Intrathecal Penicillin in Bacterial Meningitis. *Surgery* 1947 21 683

The variable reports regarding the efficacy of penicillin by various routes of administration warrants any additional information that will be of benefit. The present report, from the Memorial Hospital New York, concerns 3 patients with meningitis, in whom the intrathecal administration of large doses of penicillin was believed to be of unequivocal benefit.

In both cases the meningitis was due to direct invasion of the subarachnoid spaces following operative procedure about the nasal cavity and ethmoid and sphenoid sinuses respectively. At the onset, therapy consisted of treatment with penicillin intramuscularly and with sulfonamides orally in the doses usually recommended.

In the first case the infection (*Streptococcus viridans*) was not controlled over a period of 27 days despite the administration of 8,640,000 units of penicillin. At that time 100,000 units of sodium penicillin dissolved in 5 c.c. of spinal fluid were injected intrathecally daily. On the fourth day the patient had two generalized convulsive seizures on the fifth day she was found to be disoriented and drowsy. Only 10,000 units were given intrathecally for another 3 days and all medication was then discontinued since the laboratory tests and temperature indicated that the patient had recovered. Although the authors believe that the convulsions and mental aberrative episodes were not due to penicillin this point is easily doubted. However the undoubted control of the infection is of the greatest importance.

In the second case, the patient was treated with 50,000 units of sodium penicillin in 5 c.c. of spinal fluid injected very slowly intrathecally. This was started at the beginning of the meningitis although the patient had been receiving penicillin and the sulfonamides prophylactically for 3 days. Cultures revealed a pure growth of *Streptococcus hemolyticus* (group A). Subsequent studies revealed the organism to be relatively resistant to penicillin. No untoward neurotoxic signs were noted.

Despite the known potential dangers of penicillin intrathecally the use of large doses of penicillin in the absence of lumbar block is recommended in fulminating and resistant cases of meningitis.

JACK I. WOOLF, M.D.

SYMPATHETIC NERVES

Gottmann L., Riches, E. W., Whitteridge D. Johnson P. H. A., and Others: Discussion on the Treatment and Prognosis of Traumatic Paraplegia. *Proc. R. Soc. M. Lond.* 1945 4, 319.

CUTTMAN: The studies in this article were made upon 177 casualties who were patients in the Spinal Injuries Center, Ministry of Pensions Hospital, Stoke Mandeville since February 1944. Of this group, 108 patients had suffered gunshot injuries while 69 had fractures of the spine. Emphasis was placed on the care of the bladder with the use of the intermittent or constant indwelling catheter and modified tidal drainage. Suprapubic cystotomy was deemed preferable for cases with narrow urethras, urethral strictures, or presenting other local urethral injuries. The development of the automatic reflex activity of the bladder and voluntary micturition by pressure was encouraged. Prevention of stone formation was accomplished by shortening the interval of recumbency and by restoring the best possible fitness of the patient. Stress was placed on the importance of recognition of autonomic phenomena above the site of a complete cervical or thoracic cord lesion caused by abnormal distention of a viscus without pain below the site of the lesion. Prevention of contractures and atrophy were carried out by adequate physiotherapy. Control of spasm was accomplished in selected cases by the intramedullary injection of 1 to 2 c.c. of 80 per cent alcohol into the thoracolumbar junction. For generalized rehabilitation of paraplegics a center has been set up near Mandeville to provide aid in social and industrial readjustment.

RICHES: In care of the bladder, drainage is essential but it need not be immediate if strictly aseptic methods for catheterization are not available. A high suprapubic cystostomy with tidal drainage affords the best type of care. With an indwelling catheter urethritis is always present and extension of ascending infection is by direct lymphatic spread through the perirethral lymphatics to the kidney. There is no such communication between the suprapubic catheter and the kidneys, and ascending infection is less common from a bladder which is draining freely. As soon as an automatic bladder becomes established on tidal drainage the small high suprapubic cystostomy wound closes rapidly and spontaneously, whereas closure of a low lying cystostomy is prolonged and requires excision. Infection, recumbency and dilatation of the upper urinary tract are important factors in the production of renal calculi. Since these do not disappear on ambulation, their removal must be surgical. Renal calculi can occasionally be dissolved by the use of the Albright Saby solution in the suprapubic tidal drain.

WHITTERIDGE: With distention of the bladder in patients having a complete cervical or high thoracic (above T₆) spinal cord lesion there is a tendency toward marked vasoconstriction with a rise in the blood pressure, a sharp drop in the pulse rate, a great

increase in volume of the pulse, and a rise in the temperature of the ear. With a lesion at or below T₆ there is a slight rise in the blood pressure, a drop in the pulse rate and volume, and a decrease in the temperature of the legs. In the latter group of cases vasomotor regulation is possible because there still is a large vascular bed which can be used by the vasomotor center for compensatory dilatation. With lesions above T₆ the area controlled by the vasomotor center is greatly reduced. There is no doubt that this phenomenon is due to a spinal reflex.

JOHNSON: Rehabilitation is less difficult in paraplegics with more distal cord lesions than in paraplegics with complete cervical or high thoracic cord transections because of the fewer vasomotor disturbances in the former group. In the higher level type of case the patient exhibits much more profound and lasting effects upon assuming an upright position than in the low level type. This is due to a cerebral anemia which is secondary to the drop in blood pressure associated with the higher cord lesions.

ROBERTS: Neither the neurologist nor the orthopedic surgeon alone can adequately deal with the care and rehabilitation of paraplegics, and the argument for their segregation into special centers is indisputable.

RICHARD C. SCHWIMM, M.D.

Legier L., and Costa M.: Recurrent Syncope Associated with Sinus Hyperactivity. Cure by Denervation of the Carotid Sinus. (Syncope à répétition liée à une hyperactivité sinusale. Guérison par dénervation sino-carotidienne.) *Presse méd.* 1947 55, 174.

A 65 year old male presented himself stating that for the past 15 months he had been experiencing episodes varying from simple syncope with slight dyspnea and bradycardia, to severe periods of unconsciousness, occasionally with convulsions. When unconscious there was often complete cessation of the pulse and respiration. He never experienced incontinence or tongue biting and was able to tell when these episodes were approaching. The attacks were precipitated by any effort, such as sitting, changing position, defecating, urinating. Because of this illness the patient was forced to follow an extremely rigid way of life by discontinuing all activity and residing at home. Even these severe restrictions did not completely stop all the episodes or their equivalents.

Empirically, warm compresses on the neck were found to be of greatest value more so than various stimulating drugs. Numerous clinical and laboratory examinations with particular attention to the cardiac status, showed no abnormalities. The blood pressure was 130/80. Many medical treatments were attempted but none proved successful. Iodides, adrenalin, atropine, digitalis, atrophanthin, acetylcholine, theophylline, vitamin B, and various diets. The diagnosis was verified by the following maneuver:

The patient attempted to sit up. This caused marked syncope with loss of consciousness and cessa-

tion of the pulse and respiration which resumed slowly after several minutes. Pressure over the left carotid sinus caused the unconsciousness to reappear and the pulse rate to slow. Pressure on the right, to the contrary produced no effect. During one of these episodes the left carotid sinus was injected with novocaine with immediate return of consciousness.

Treatment was instituted by infiltrating the left carotid sinus with novocaine and denervating it. Atropine was given before the operation. Following this procedure the patient no longer presented any of the former reactions and at the time of writing had had no recurrences.

This syndrome was first described by Tschermak in 1886 who noted that pressure on the right lateral aspect of the neck in a patient caused a sensation of weakness, vertigo and slowing of the pulse. To date, more than 100 clinical cases have been published. The crisis is characterized by vertigo, sweating, loss of consciousness, pallor, apnea, cessation of pulse, hypotension, occasionally convulsions and rarely incontinence. One death has been reported due to compression of the carotid sinus. Transitory and permanent hemiplegias have occurred. The syndrome has been noted in many various forms, and minor equivalents have been described as simple syncope, vertigo, malaise, and mild anxiety.

The syndrome is precipitated by traumatism often only slight. It can be produced by the constriction of a tight collar by shaving and less frequently by simple cervical hyperextension or the hyperextension when lying in a lateral supine position. Certain instances have appeared with carotid tumors; their excision abolished the symptoms. Often, no precipitating reason can be found and it is hypothesized that the sinus is stimulated by a sudden rise in the blood pressure in response to exertion or some hormonal secretion. The definitive diagnosis is established by production of the syndrome by compression of the carotid sinus and of its abolition by infiltration of this region.

A definite etiology of carotid sinus hyperactivity cannot be given at present, although arteriosclerosis has been suggested. The carotid sinus is often affected by arteriosclerosis and this pathological change may disturb its normal functioning.

According to Ferris, Capps, Weiss, and Munro whose observations were based on 52 cases, 3 different types of hyperactivity have been distinguished.

1. The vagal type seen in one third of the cases. The symptoms are related to a sinoauricular or an atriocentric heart block which causes a cerebral anemia. Adrenalin or atropine prevents the attack. This syndrome is relieved by medical treatment.

2. The depressor type, rarely found. Stimulation of the carotid sinus causes a generalized venous dilatation with a secondary hypotension. These symptoms respond to adrenalin but are not in-

fluenced by atropine. Other stimulants such as ephedrine and benzedrine are helpful. Denervation of the sinus is indicated in this type.

3. The cerebral type observed in two-thirds of the cases. Sinus stimulation appears to cause hypothalamic activity. Atropine and adrenalin have no effect. This syndrome is not helped by medical treatment and should be treated exclusively by surgery (denervation of the sinus).

Operation should be done under local anesthesia only after preoperative administration of atropine and novocaine infiltration of the carotid sinus. This is to prevent the carotid sinus syndrome from recurring during operation. It is rarely that the denervation needs to be done bilaterally. In the 28 cases collected from the literature, surgery was done unilaterally in 25 instances with definitive cure in 65 per cent. C. FARRAR KITTLE, M.D.

MISCELLANEOUS

Poppen J. L., and Lemmon C.: The Surgical Treatment of Hypertension. *J. Am. M. Ass.* 1947 134: 1.

The authors report a consecutive series of 100 cases of hypertension treated by an extensive thoracodorsal sympathectomy from the third or fourth thoracic through the second lumbar ganglia. This was done to attain more permanent and immediate lowering of the blood pressure than they had apparently achieved by the Smithwick operation.

The operative procedure was carried out through a curvilinear incision from the sixth rib to the border of the twelfth rib. A 4 cm. portion of the eighth and eleventh ribs was resected and the chain was resected without incision of the diaphragm. The operation was performed under high spinal anesthesia supplemented with sodium pentothal.

The most important problem in regard to sympathectomy lies in the proper selection of the patients. Although definite criteria are lacking, a correlation of the various tests and the clinical impression will help to rule out many patients that would not be benefited. The contraindications are as follows: cardiac failure, renal failure, and severe retinal arteriosclerosis with a fixed blood pressure. Patients with early and mild hypertension were not operated upon. Considerable caution was exercised in the selection of patients with a previous coronary thrombosis, angina pectoris, auricular fibrillation, or gallop rhythm. Cerebrovascular episodes in an otherwise suitable candidate were not considered a contraindication to surgery. The most suitable candidates were those under 50 years of age with definite progression of the hypertension, ocular fundi of grades 2, 3, or 4 (Keith, Wagener and Barker) and in whom the examination did not reveal any of the contraindications already mentioned.

The interpretation and evaluation of results were modified slightly in that a normal blood pressure in an otherwise incapacitated patient was not considered a good result, but a blood pressure slightly

above the accepted level of 150 mm. systolic and 100 mm. diastolic in a patient in excellent health was considered a good result. Although the authors realize the inadequacy of using the blood pressure level as a criteria, there is no other scientific measuring rod at present. The results are quoted as follows: good, 4 per cent fair 21 per cent and unsatisfactory 22 per cent. Six patients died after dismissal from the hospital but there was only a 1 per cent surgical mortality. A rather surprising finding was that the known duration of the hypertension did not influence the results of the sympathectomy. Although the greater number of patients had their hypertension less than 5 years the results were not appreciably better in these than they were in the patients with hypertension of longer duration.

An apparently worthwhile innovation is the practice to perform a unilateral sympathectomy when a nephrectomy performed in the presence of hypertension. If the blood pressure drops to normal, the patient is dismissed for follow up; however if no improvement ensues the second stage sympathectomy is then performed. JACK I. WOODS, M.D.

Palmer, R. S. The Surgical Treatment of Hypertension. *J Am Med Ass* 94 349.

The author reports his evaluation of sympathectomy for hypertension from the standpoint of a medical observer. The effect upon the blood pressure was considered as the most important criterion. The upper limits of the normal blood pressure were considered as 150 mm. Hg. systolic and 100 mm. Hg. diastolic. After 5 years only 12 per cent of 54 patients treated by supradiaphragmatic sympathectomy had a normal or near normal blood pressure, the favorable results occurring largely in hypertension of grades 1 and 2. The results were much improved after Smithwick extended the resection of the sympathetic chain from above the ninth dorsal ganglion to below the second lumbar ganglion.

A 1 year followup of 49 patients who underwent the thoracodorsal sympathectomy revealed that 55 per cent had a normal blood pressure. The patients with hypertension of grades 1, 2 and 4 obtained the better results.

After 3 years a follow-up study of 63 sympathectomized patients gave the following results: 50 per cent were dead, 45 per cent had failed to obtain a satisfactory blood pressure response, and 25 per cent had maintained normal or near normal blood pressures. The patients that may have obtained a partial drop in blood pressure with subjective improvement were not listed. In comparing these figures

with a medical series, it was found that 30 per cent of the latter had expired. A group of 100 patients maintained on a general medical regimen plus potassium thiocyanate revealed that under the best conditions of medical treatment a sustained normal blood pressure could be effected in only 12 per cent of the patients.

A study of the surgical group failed to reveal a definite guide as to the selection of patients. However the following facts were noted: (1) in a greater proportion of the successes the blood pressure would approach the normal levels spontaneously; (2) high maximum levels of diastolic pressure were more frequent in the unsuccessful cases; (3) the relative test resulted in a drop to normal in 7 of 14 successful cases and in 4 of 13 unsuccessful cases; and (4) the pulse pressure groupings had no significance. In general, it is stated that women and younger patients with less evidence of organic changes have better chances of obtaining good results.

Although 5 per cent of the definite successes occurred in cases of hypertension of grades 1 and 2, the most important observation pertained to the 17 cases in the malignant hypertensive group. Three patients who obtained normal pressures are alive and working 1 for 3 years and 2 for about 5 years. Two failed to obtain a drop in blood pressure but are active and working 1 for 3 years and the other for 5 years. These are certainly outliers, their life expectancy. The remaining 6 patients have died but all had either renal or cardiac damage, or both. It would be of interest to know whether any of these had obtained a satisfactory blood pressure response to surgery.

An important phase of sympathectomy pertains to the various physiologic effects, disabilities, and dangers. A 1 per cent mortality rate was found in this series and it compared favorably with other groups. Complications of surgery are the development of extrapleural fluid, pneumothorax, and basal atelectasis; however these are usually overcome easily. Postoperative cruritis is frequent and may last from a few weeks to several months. Postural hypotension with compensatory phenomena, such as tachycardia and breathlessness may persist for several months and to a lesser degree for longer periods of time.

Despite the fact that only a fourth of the patients were deemed to have received the maximum benefit of a maintained normal blood pressure, "perhaps 60 per cent" showed a persistent improvement in the general level of their blood pressure.

JACK I. WOODS, M.D.

SURGERY OF THE THORAX

CHEST WALL AND BREAST

Hopkins, F. S., and Egnatz, N. Carcinoma of the Breast. *N. England J. M.* 1947 236 330.

The routine procedure at the time of the first visit of a patient with suspected cancer of the breast consisted in taking x-ray films of the chest as well as of the upper ends of the humeri, the skull, the spine, and the pelvis including the upper ends of the femurs. Unsuspected metastases have been found in several cases that would otherwise have been deemed operable. Other contraindications that have been found are fixed matted lymph nodes in the axilla and definite inflammatory carcinoma. If there was any suspicion of involvement of the supraclavicular nodes, a biopsy was first done.

The patient's general condition was not considered as a contraindication to operation although most of the simple mastectomies were done because of poor physical condition. There were deaths in 3 cases after radical operations and 1 death following a simple mastectomy—all in patients over 75 years of age and in poor physical condition. Since then, cases in the older age group were carefully evaluated and only referred for radiation therapy if there was a life expectancy of at least 5 years. After this procedure had been adopted there were no postoperative deaths.

Most operations began with a local excision of the tumor and a frozen section to confirm the diagnosis. A formalin-soaked sponge was placed in the cavity before suture was done, and the wound was sealed with collodion and gauze. The usual incision was of the Rodman-Greenough type. The important feature is to make the incision include an area of skin at least as wide as the breast and with the tumor at least 5 cm. from the incision. After the pectoral muscles have been divided at their insertion, a meticulous dissection of the axilla is made, all areolar tissue being removed from the axillary vein. The upper rectus fascia is removed with the breast, muscles, and axillary contents. Wide under-cutting usually permits closure without grafting. The cure rate for radical mastectomies was in direct proportion to the duration of the operation. The procedures lasting less than an hour amounted to 28.6 per cent, whereas for each successive hour of operating time they amounted to 35.3, 34.3, 43.7 and 56.3 per cent respectively.

Preoperative x-ray treatment was not used but all patients with axillary metastases were given postoperative radiation. Women who were still menstruating were offered ovarian radiation.

In the determination of the results the operative deaths and patients alive with recurrences were classed as failures. Of the 70 patients who had radical operations 30 or 43 per cent, are living and well, without evidence of cancer. Of the 45 cases

with axillary metastases 1.4, or 31 per cent, are considered 5 year cures. Sixteen of 25 patients or 64 per cent, with no involvement of the axillary lymph nodes, are living and well. It is the authors' opinion that complete radical operation should be done at the time of the first surgical approach to a cancer of the breast.

The following are considered definite contraindications to operation: distant metastases, inflammatory carcinoma, supraclavicular metastases, edema of the arm, intercostal or parasternal nodules, satellite nodules in the skin over the breast, extensive edema of the skin and carcinoma developing during pregnancy and lactation. Other factors of such poor prognostic significance that the presence of any two is regarded as a contraindication to operation include ulceration of the skin, limited edema of the skin (less than a third) fixation of the tumor to the chest wall, axillary lymph nodes measuring 2.5 cm. or more in the transverse diameter, fixation of the axillary lymph nodes to the skin or the deep structures of the axilla and metastases in the nodes proved by biopsy.

The percentage of lymph node involvement and the microscopical grade of the tumor are of aid in making a prognosis. X-ray treatment is of great help in making the patient more comfortable.

LEE FULLER, M.D.

TRACHEA, LUNGS, AND PLEURA

Adams, R., and Picarra, B. J.: Bronchiectasis. *J. Am. R. A. Soc.* 1947 134 240.

This is a report of 50 consecutive surgically treated cases of bronchiectasis at the Lahey Clinic in the 5 year period ending August 31, 1945. There were no deaths in the series, which showed that bronchiectasis may be cured and functional usefulness restored by appropriate pulmonary resection.

Bronchiectasis is an important pathological entity from a socioeconomic viewpoint. A chronic illness will alter the personality and influence the character and career of an individual. Persons with this disease are branded as having tuberculosis. Children's schooling is neglected because their illness renders them unable to keep pace with their classmates. When the teens are reached antisocial patterns are more clearly defined and in the 20's and early 30's increasing responsibilities of life and decreasing recuperative powers lead to frequent break-downs.

No one etiological agent can be found for bronchiectasis. Among the common contributing causes are (1) diseases of the accessory air passages (2) acute infections of the upper respiratory tract or infectious diseases (3) congenital malformations such as cystic disease of the lung; (4) bronchial obstruction due to a foreign body, hyperplasia of the

mediastinal nodes or tumor (5) emphysema or atelectasis and (6) situs inversus and sinusitis. From these it can be seen that the basic mechanisms in the development of bronchiectasis are infection of the bronchial wall and bronchial obstruction.

In some cases following pneumonia, x ray evidence of bronchiectasis appears and disappears in 1 or 2 months as silently as it developed. This is called "pseudobronchiectasis" or "transitory bronchiectasis."

Initially infection causes hyperemia and thickening of the mucosa. Eventually highly vascular papillary projections of the mucosa protrude into the lumen. From dilatation peripheral to an obstruction, cylindrical bronchial enlargement or ca. titation is produced. Later the lung parenchyma is replaced by fibrous tissue. When the cavities become infected, purulent material accumulates. If putrefactive organisms invade secondarily the sputum odor is foul. Occasional pulmonary abscesses form.

Histologically one sees inflammation, proliferation, and tissue destruction. The bronchial wall is infiltrated with leucocytes and lymphocytes. If the disease is chronic, the glands, elastic tissue, muscle fibers and even cartilage may be replaced by fibrous tissue. The epithelial continuity may be broken but it is the last to be destroyed. Blood vessels in the wall may rupture or become thrombosed (if infected, a metastatic brain abscess may result). The adjacent pulmonary tissue becomes infected and, later fibrotic. There are peripheral zones of compensatory emphysema.

In congenital bronchiectasis the lung contains many cystlike cavitations lined by a layer of flattened or cuboidal epithelium often ciliated. This pathologic entity may be called congenital cystic disease of the lung.

Bronchiectasis may involve one or more bronchopulmonary segments within a lobe or it may be multilobar. The basal division of the lower lobes is most frequently involved as opposed to lung abscess which usually occupies the dorsal division of the lower lobe. The anatomic pattern is static, and the disease does not spread from lobe to lobe. This justifies the rationale of resection of the involved bronchopulmonary segment. Most of the unsatisfactory results are due to failure to appreciate the high incidence of residual disease in an unresected lingula.

Clinically one may see a chronic uncontrollable productive cough, foul breath, hemoptysis, purulent sputum, chest pain and dyspnea on exertion. Symptoms are usually more evident in the morning.

Physical signs vary with the extent of secondary infection and atelectasis. Dullness, diminished breath sounds, and moist rales are positive findings over the involved segments. Clubbed fingers are common in long standing disease.

The x-ray findings of collapse, dilated bronchi, and compensatory expansion of the adjacent pulmonary tissue are characteristic. Fluoroscopic and lateral views are desirable. Bronchography is rarely neces-

sary for diagnosis but is necessary for determining the extent of the process prior to surgical attack.

Patients under 50 with unilateral disease limited to one collapsed lobe, with infection temporarily quiescent, and who otherwise are in good physical condition constitute the best candidates for surgical treatment. Patients with diminished respiratory reserve, bilateral disease, advanced emphysema and fibrosis, chronic asthma, and chronic pulmonary suppuration are greater surgical risks.

Operation should be carried out only when the patient is in the best physical condition. He is given a nutritious diet supplemented by vitamins and iron, daily periods of rest and graded exercise and postural drainage supplemented by bronchoscopic aspirations when necessary. Associated pleural infections are drained dependently until active infection is minimized. Sinus disease is eradicated. Sulfonamide or penicillin (by muscular injection or inhalation) is given preoperatively to reduce infection.

The operative technique stresses gentle careful dissection to complete incomplete fissures. The hilar vessels are individually exposed and tied. The bronchus should be closed in meticulous fashion with a row of fine interrupted silk stitches, the posterior membranous portion being folded into the anterior cartilaginous portion and the stump being buttressed with a free fascial graft or a pedicled flap of parietal pleura. The tourniquet technique is no longer used.

After operation, measures are employed to prevent shock, anoxemia, or failure of complete lung expansion. Fluid formation in the pleural space should be prevented or removed and obstruction of the bronchial tree must be prevented. Blood transfusions and oxygen therapy are routine. Opiates are used sparingly and voluntary coughing to clear secretions is encouraged. Negative intrathoracic pressure is maintained by a drainage catheter which is usually removed in 3 days. Bronchoscopic aspiration is used when indicated. Prophylactic use of penicillin is continued for about 1 week. Infection and emphysema are the common complications. Effective stump closure the use of sulfonamides or penicillin, and the complete re-expansion of the remaining lobe or lobes aid in eradicating postoperative infection.

Forty-five of the patients contracted the disease before the fifth decade. In 50 per cent the duration of symptoms was from 1 to 5 years, in 30 per cent from 5 to 10 years, and in 20 per cent from 10 to 20 years. Associated infections of the accessory nasal sinuses or of the respiratory system were present in nearly all of the patients. There were 31 women and 19 males in this series.

All 50 patients were treated by pulmonary resection. In 19 cases the disease was on the right side in 31 on the left, and in 5 bilateral involvement was present. One pneumonectomy was done, bilobectomies were done in 18 cases. The lingula was affected in 43.3 per cent of the cases.

All of the patients received intratracheal anesthesia with cyclopropane-ether. There were 3 postoperative emphysemas requiring drainage, 1 periaortic

bronchopleural fistulas and 1 thrombophlebitic complication. In this series followups from 1 month to 5 years were carried out and all but 2 patients with contralateral disease are in good health. There were no deaths.

The prognosis following pulmonary resection is favorable. Almost all of the patients were cured or significantly benefited. Forty-two of the 50 have been able to resume normal activity. From this study it can be concluded that beneficial surgical results indicate the inefficiency of medical treatment. True cure can be obtained only by resection of the diseased lung tissue. Other treatment only results in symptomatic relief. Surgery should be advised early in the disease.

ROBERT R. BOWLOW, M.D.

Ochsner, Alton; DeBaKey, Michael; and Dixon, Leonard: Primary Pulmonary Malignancy Treated by Resection. *Ann Surg* 1947 125 522

Ochsner and his associates present a very completely detailed analysis of 360 cases of carcinoma of the lung observed during the 11 year period from 1936 to 1946 inclusive.

Twenty-seven charts add greatly to the incidence of the presentation. Of the total 360 cases 129 were resected. Among these were 124 cases of bronchogenic carcinoma, 2 of fibrosarcoma and 1 case each of melanosisarcoma, neurogenic sarcoma and lymphoblastoma.

Lung carcinoma was encountered over twice as frequently among white as among colored persons.

Eighty-six per cent of the lung carcinomas were in males. (In 6,766 collected cases 79 per cent were in males adenomas however are slightly more frequent in females.) Primary cancer of the lung is exceeded only by primary cancer of the stomach in males.

The great majority of cases (over 87%) occurred in patients between the ages of 40 and 70 years. Among the 129 resected cases no significant etiologic factor was found. Neither occupation nor smoking seemed to be of etiologic significance.

The clinical picture is not sharply characteristic and the onset is insidious. The most common symptoms were as others have found: cough, weight loss, discomfort in the chest and hemoptysis, in that order. In many of the early cases only one or two of these symptoms were present. Early physical findings are likely to be negative. Seventy-six cases were found in the right lung and 53 in the left. The upper lobes on each side and the right lower lobe were involved in practically the same incidence.

Positive roentgen diagnosis was made in 81 per cent of the cases. Bronchoscopy was done in 112 cases. In 17 of the 129 cases x rays showed the tumor to be so peripheral that bronchoscopy was not done. Biopsy was obtained in 61 per cent. Eighty-one per cent of these cases were positive. Aspiration biopsy is condemned because of the danger of pleural implantation; the authors had 2 such cases. Exploration for diagnosis is obligatory if carcinoma of the lung cannot be positively excluded by other means.

Pneumonectomy by anterior approach is the treatment of choice. Operability is discouragingly low and resectability even lower: among 29 per cent of 2,034 cases of primary malignancy from the literature operation appeared feasible but resection was possible in only 13.4 per cent. The more recent reports show a trend toward higher incidence and of the 360 cases reported 58 per cent were explored and 36 per cent resected.

Among the 360 cases of pulmonary malignancy diagnosed clinically 109 or 30 per cent were clearly inoperable. Of the 251 patients regarded as operable 41 or 16 per cent refused surgery. Of the 210 cases explored 81, or 38 per cent, proved inoperable leaving 129 (61% of those explored or 36% of the total series) in which resection could be done.

Postoperative infection (empyema) occurred in 15 of the 129 cases, or 11.6 per cent. In 5 instances (3.8%) the infection was the result of a blown bronchus. Ten of the patients with postoperative infection died. Chemotherapy in the authors' hands has not materially influenced the morbidity in post-operative infection.

Among the 81 cases explored but not resected there were 14 hospital deaths (17.3%). In the resectable group of 129 there were 32 hospital deaths (24.8%). The total operative mortality risk then was 22 per cent. Although the operative mortality was high the mortality in absence of operation is 100 per cent.

Prior to 1942 the hospital mortality was 44.5 per cent and since 1942 it was 10.6 per cent. The average postoperative hospital stay prior to 1942 was 32 days and after 1942 13 days.

Of the 107 patients resected only a little over one-half (54%) survived 6 months. Six (22%) of 27 resected patients were alive at the end of 5 years. When hospital deaths were excluded the survival rate of those operated 5 years or more ago was 40 per cent. None with extension of the lesion survived longer than 4 years after operation. If only those with localized lesions were included the 5 year survival rate was 50 per cent. If a person lives through the third year after operation he has a very good chance of being alive at the end of 5 years; for the distribution curve of survival rate by the third year has been established and continues almost as a plateau until the fifth year.

Among the 107 patients resected 38.7 per cent had extension at the time of resection.

When survival rates were calculated according to the year of operation it was found that the rate of survival in each postoperative year improved after 1942 as compared to before 1942. This perhaps reflects improvements in technique. This improvement is shown in patients both with and without localization of the malignancy.

At the present time only 36 per cent of the patients with clinical cases of carcinoma of the lung are resectable and of these only 8 per cent survive 5 years or more. Twenty-two per cent could enjoy a 5 year survival if diagnosis was made early enough to permit resection.

FRANK B. QUERRY, M.D.

mediastinal nodes, or tumor (5) emphysema or atelectasis and (6) *altus inversus* and *sinusitis*. From these it can be seen that the basic mechanisms in the development of bronchiectasis are infection of the bronchial wall and bronchial obstruction.

In some cases following pneumonia, x-ray evidence of bronchiectasis appears and disappears in 1 or 2 months as silently as it developed. This is called "pseudobronchiectasis" or "transitory bronchiectasis."

Initially infection causes hyperemia and thickening of the mucosa. Eventually highly vascular papillary projections of the mucosa protrude into the lumen. From dilatation peripheral to an obstruction cylindrical bronchial enlargement or cavitation is produced. Later the lung parenchyma is replaced by fibrous tissue. When the cavities become infected purulent material accumulates. If putrefactive organisms invade secondarily, the sputum odor is foul. Occasional pulmonary abscesses form.

Histologically one sees inflammation, proliferation and tissue destruction. The bronchial wall is infiltrated with leukocytes and lymphocytes. If the disease is chronic, the glands, elastic tissue, muscle fibers, and even cartilage may be replaced by fibrous tissue. The epithelial continuity may be broken but it is the last to be destroyed. Blood vessels in the wall may rupture or become thrombosed (if infected, a metastatic brain abscess may result). The adjacent pulmonary tissue becomes infected and, later fibrotic. There are peripheral zones of compensatory emphysema.

In congenital bronchiectasis the lung contains many cystlike cavitations lined by a layer of flattened or cuboidal epithelium often dilated. This pathologic entity may be called congenital cystic disease of the lung.

Bronchiectasis may involve one or more bronchopulmonary segments within a lobe or it may be multilobar. The basal division of the lower lobes is most frequently involved as opposed to lung abscess which usually occupies the dorsal division of the lower lobe. The anatomic pattern is static, and the disease does not spread from lobe to lobe. This justifies the rationale of resection of the involved bronchopulmonary segment. Most of the unsatisfactory results are due to failure to appreciate the high incidence of residual disease in an unresected lingula.

Clinically one may see a chronic uncontrollable productive cough, foul breath, hemoptysis, purulent sputum, chest pain and dyspnea on exertion. Symptoms are usually more evident in the morning.

Physical signs vary with the extent of secondary infection and atelectasis. Dullness, diminished breath sounds and moist rales are positive findings over the involved segments. Clubbed fingers are common in long-standing disease.

The x-ray findings of collapse, dilated bronchi and compensatory expansion of the adjacent pulmonary tissue are characteristic. Fluoroscopy and lateral views are desirable. Bronchography is rarely neces-

sary for diagnosis but is necessary for determining the extent of the process prior to surgical attack.

Patients under 50 with unilateral disease limited to one collapsed lobe with infection temporarily quiescent, and who otherwise are in good physical condition constitute the best candidates for surgical treatment. Patients with diminished respiratory reserve, bilateral disease, advanced emphysema and fibrosis, chronic asthma and chronic pulmonary suppuration are greater surgical risks.

Operation should be carried out only when the patient is in the best physical condition. He is given a nutritious diet supplemented by vitamins and iron, daily periods of rest and graded exercise and postural drainage supplemented by bronchoscopic aspirations when necessary. Associated pleural infections are drained dependently until active infection is minimized. Sinus disease is eradicated. Sulfonamide or penicillin (by muscular injection or inhalation) is given preoperatively to reduce infection.

The operative technique stresses gentle careful dissection to complete incomplete fissures. The hilar vessels are individually exposed and tied. The bronchi should be closed in meticulous fashion with 2 rows of fine interrupted silk sutures, the posterior membranous portion being folded into the anterior cartilaginous portion and the stump being buttressed with a free fascial graft or a pedicled flap of parietal pleura. The tourniquet technique is no longer used.

After operation, measures are employed to prevent shock, anoxemia, or failure of complete lung expansion. Fluid formation in the pleural space should be prevented or removed and obstruction of the bronchial tree must be prevented. Blood transfusions and oxygen therapy are routine. Opiates are used sparingly and voluntary coughing to clear secretions is encouraged. Negative intrathoracic pressure is maintained by a drainage catheter which is usually removed in 3 days. Bronchoscopic aspiration is used when indicated. Prophylactic use of penicillin is continued for about 2 weeks. Infection and empyema are the common complications. Effective stump closure, the use of sulfonamides or penicillin, and the complete re-expansion of the remaining lobe or lobes aid in eradicating postoperative infection.

Forty-five of the patients contracted the disease before the fifth decade. In 50 per cent the duration of symptoms was from 1 to 5 years, in 30 per cent from 5 to 10 years, and in 20 per cent from 10 to 20 years. Associated infections of the accessory nasal sinuses or of the respiratory system were present in nearly all of the patients. There were 31 women and 19 males in this series.

All 50 patients were treated by pulmonary resection. In 19 cases the disease was on the right side, in 31 on the left, and in 5 bilateral involvement was present. One pneumonectomy was done bilobectomies were done in 18 cases. The lingula was affected in 43.3 per cent of the cases.

All of the patients received intratracheal anesthesia with cyclopropane-ether. There were 5 post-operative empyemas requiring drainage, 3 persistent

bronchopleural fistulas, and 1 thrombophlebitic complication. In this series followups from 1 month to 3 years were carried out, and all but 2 patients with contralateral disease are in good health. There were no deaths.

The prognosis following pulmonary resection is favorable. Almost all of the patients were cured or significantly benefited. Forty two of the 50 have been able to resume normal activity. From this study it can be concluded that beneficial surgical results indicate the inefficiency of medical treatment. True cure can be obtained only by resection of the diseased lung tissue. Other treatment only results in symptomatic relief. Surgery should be advised early in the disease.

ROBERT R. BRONZOW M D

Ochaner Alton; DeBailey Michael; and Dixon Leonard Primary Pulmonary Malignancy Treated by Resection *Ann. Surg.*, 1947 125 522

Ochaner and his associates present a very completely detailed analysis of 360 cases of carcinoma of the lung observed during the 11 year period from 1936 to 1946 inclusive.

Twenty-seven charts add greatly to the lucidity of the presentation. Of the total 360 cases 129 were resected. Among these were 124 cases of bronchogenic carcinoma, 2 of fibrosarcoma and 1 case each of melanosisarcoma, neurogenic sarcoma and lymphoblastoma.

Lung carcinoma was encountered over twice as frequently among white as among colored persons.

Eighty six per cent of the lung carcinomas were in males. (In 6769 collected cases 79 per cent were in males adenomas however are slightly more frequent in females.) Primary cancer of the lung is exceeded only by primary cancer of the stomach in males.

The great majority of cases (over 87%) occurred in patients between the ages of 40 and 70 years. Among the 129 resected cases, no significant etiologic factor was found. Neither occupation nor smoking seemed to be of etiologic significance.

The clinical picture is not sharply characteristic and the onset is insidious. The most common symptoms were, as others have found, cough, weight loss, discomfort in the chest, and hemoptysis in that order. In many of the early cases only one or two of these symptoms were present. Early physical findings are likely to be negative. Seventy-six cases were found in the right lung and 53 in the left. The upper lobes on each side and the right lower lobe were involved in practically the same incidence.

Positive roentgen diagnosis was made in 81 per cent of the cases. Bronchoscopy was done in 123 cases. In 17 of the 129 cases, x rays showed the tumor to be so peripheral that bronchoscopy was not done. Biopsy was obtained in 61 per cent. Eighty-one per cent of these cases were positive. Aspiration biopsy is condemned because of the danger of pleural implantation; the authors had 2 such cases. Exploration for diagnosis is obligatory if carcinoma of the lung cannot be positively excluded by other means.

Pneumonectomy by anterior approach is the treatment of choice. Operability is discouragingly low and resectability even lower, among 29 per cent of 2034 cases of primary malignancy from the literature operation appeared feasible but resection was possible in only 13.4 per cent. The more recent reports show a trend toward higher incidence and of the 360 cases reported 58 per cent were explored and 36 per cent resected.

Among the 360 cases of pulmonary malignancy diagnosed clinically 109 or 30 per cent, were clearly inoperable. Of the 251 patients regarded as operable 41 or 16 per cent refused surgery. Of the 210 cases explored 81, or 38 per cent proved inoperable, leaving 129 (61% of those explored or 36% of the total series) in which resection could be done.

Postoperative infection (empyema) occurred in 15 of the 129 cases, or 11.6 per cent. In 5 instances (3.8%) the infection was the result of a blown bronchus. Ten of the patients with postoperative infection died. Chemotherapy in the authors' hands has not materially influenced the morbidity in post-operative infection.

Among the 81 cases explored but not resected, there were 14 hospital deaths (17.3%). In the resectable group of 129 there were 32 hospital deaths (24.8%). The total operative mortality risk then was 22 per cent. Although the operative mortality was high the mortality in absence of operation is 100 per cent.

Prior to 1942 the hospital mortality was 44.5 per cent and since 1942 it was 10.6 per cent. The average postoperative hospital stay prior to 1942 was 32 days and after 1942 13 days.

Of the 107 patients resected only a little over one-half (54%) survived 6 months. Six (22%) of 27 resected patients were alive at the end of 5 years. When hospital deaths were excluded the survival rate of those operated 5 years or more ago was 40 per cent. None with extension of the lesion survived longer than 4 years after operation. If only those with localized lesions were included the 5 year survival rate was 50 per cent. If a person lives through the third year after operation he has a very good chance of being alive at the end of 5 years, for the distribution curve of survival rate by the third year has been stabilized and continues almost as a plateau until the fifth year.

Among the 107 patients resected 38.7 per cent had extension at the time of resection.

When survival rates were calculated according to the year of operation it was found that the rate of survival in each postoperative year improved after 1942 as compared to before 1942. This perhaps reflects improvements in technique. This improvement is shown in patients both with and without localization of the malignancy.

At the present time only 36 per cent of the patients with clinical cases of carcinoma of the lung are resectable and of these only 8 per cent survive 5 years or more. Twenty two per cent could enjoy a 5 year survival if diagnosis was made early enough to permit resection.

FRANK B. QUINN M D

Rienhoff, William F. Jr.: The Present Status of the Surgical Treatment of Carcinoma of the Lung. *Ann. Surg.* 1947 125 347

Three hundred and twenty-seven patients with carcinoma of the lung have been operated upon since the first pneumonectomy was performed at Johns Hopkins Hospital 13 years ago. Total pneumonectomy was done in 113 (34%) but 115 (66%) were inoperable at time of exploration.

There was no operative mortality from exploration alone. The operative mortality from pneumonectomy (all deaths occurring within 1 month of operation regardless of cause were included) was 22 per cent. The postoperative mortality from pneumonectomy has improved from 27 per cent prior to 1939 to 21 per cent since 1939.

Twelve patients have survived 5 years or more. While the statistics presented do not present an accurate calculation of the 5 year survival rate approximately 30 per cent of the patients subjected to pneumonectomy prior to 1941 (40) survived 5 years, or about 9.4 per cent of the 128 patients explored or pneumonectomized during this period.

Sixty-nine of the patients resected are now dead. However, these lived an average of a little over 1 year following pneumonectomy. (If the 25 postoperative deaths are excluded, longevity following pneumonectomy of the remaining 44 averages 1.6 years.) The 203 patients who were explored lived for an average of only 5 months following exploration. Thus longevity even in patients not cured is materially increased by resection.

In 70 per cent of the pneumonectomy cases there were metastases to the bronchial or tracheal lymph nodes. Sixty-five per cent of the cases were squamous cell carcinomas and 35 per cent were adenocarcinomas, including pleomorphic and oat cell cancers. The adenocarcinoma is the more malignant type. The cancer was near the hilus in 90 per cent and in the periphery (silent areas) in 10 per cent.

The roentgenograms were positive in every instance of the 357 cases. Positive biopsies were obtained in 70 per cent. The sex ratio was 6 to 1 in favor of the males. The right and left lungs were involved in about the same incidence.

Symptoms of cough were present in 71 per cent, hemoptyses in 63 per cent, and pain in 50 per cent. Exploratory thoracotomy is imperative if a definite diagnosis cannot be obtained by other means.

The most important preoperative preparation is the induction of artificial pneumothorax to allow for adjustment of the cardiovascular system. One stage total pneumonectomy by the anterior approach is the operative procedure of choice. The bronchial stump is approximated with interrupted mattress sutures from 1 to 2 cm. proximal to the amputation and a pedicled flap of pleura is sutured over the viable stump. The stump lumen is cleared of blood clot or tumor tissue before closure and the patient is again examined with the bronchoscope before he leaves the table. Penicillin is used both preoperatively and postoperatively.

In the discussion RICHMOND also mentions 4 patients operated upon for solitary metastasis 3 by himself for metastatic fibrosarcoma from the tendon sheath of the thigh and 1 by BIALOCK for simple metastases from the colon. FRANK B. QUINN, M.D.

Domenico, F.: Pleuropulmonary Sclerosis of the Apex (Le clatrical pleuro-pulmonaire dell'apice). *Minerva med.*, Tor., 1947 38 343.

This discussion of the etiology and prognosis of cicatricial lesions of the apex is based on the histological studies of 5 patients dying of unrelated disease in whom no history of tuberculous infection was obtainable. In all of the cases the sections showed rather dense fibrous tissue with peripheral areas of emphysema. There were no traces of tubercula.

There is little doubt as to the tuberculous origin of these sclerotic areas and the absence of tuberculous elements excludes the possibility of re-exacerbation. EDWIN B. FARRINGTON, M.D.

HEART AND PERICARDIUM

Tausig, Helen B.: Diagnosis of the Tetralogy of Fallot and Indications for Operation. *J. Thorac. Surg.* 1947 16 34.

The four features which characterize the tetralogy of Fallot are pulmonary stenosis or atresia combined with dextroposition of the aorta, a high ventricular septal defect, and right ventricular hypertrophy.

The characteristic clinical findings are cyanosis and clubbing, a heart of normal size, usually a basal systolic murmur and a pure second sound. The electrocardiogram shows a right deviation. The x-ray shows an absence of the normal fullness of the pulmonary cones and clear lung fields. Fluoroscopy shows no pulsations at the hilus of the lungs.

There are many variables. The systolic murmur may be quite loud, or entirely absent. The second sound may be diminished or accentuated, it is never reduplicated. Cyanosis may be marked or slight, according to the degree of the oxygen unsaturation and the height of the red blood count. The oxygen saturation of arterial blood is also subject to great variation (from 88 to 10 per cent). It varies from individual to individual according to the severity of the pulmonary stenosis, and also in the same individual from day to day. The exercise tolerance of the individual shows a corresponding variation; some persons can walk a mile some not at all. Operation is indicated for those who are severely handicapped.

The operation is designed to increase the circulation of the lungs. It consists of an anastomosis between the proximal end of one of the systemic vessels to the side of one of the main pulmonary vessels. The operation is indicated only in cases in which the primary difficulty is lack of circulation to the lungs. It is possible only when there is a pulmonary artery to which to anastomose the systemic artery and the pressure in the systemic artery is

THE new edition of *Cardiovascular Disease*¹ by Scheri and Boyd is a standard textbook. The authors have successfully covered a very extensive field in a single book of 455 pages. The material presented for the most part represents a conventional viewpoint of cardiology in the United States. The book is carefully printed, well organized, and satisfactorily indexed.

The chapter on myocarditis to which the authors call particular attention may cause some debate with their readers. The chapter on heart and endocrine disorders might also provoke some discussion. Particular reference might be called to the presumed effect of estrogens upon the electrocardiogram. The pages on irradiation of autonomic reflexes to and from the heart although short, is particularly interesting.

On the whole this book is to be recommended as a standard text in cardiovascular disease.

CHADWICK C. MARR.

THE third edition of Greenblatt's *Office Endocrinology*² represents a revision and enlargement of the material presented in the first two editions. The author considers all the glands of internal secretion but the real emphasis, indeed the real value of the book lies in its comprehensive treatment of the problems concerned in female endocrinology. The presentation is intended as a guide to the endocrine problems which the general practitioner and the gynecologist may meet in their everyday practice. It is concise in its expression and does not include a great deal of theoretical material. The emphasis is on therapy, and a section on hormoneology includes a list and a discussion of many of the available estrogens, androgens, progestational hormones, adrenal cortical hormones, and pituitary hormones. There is a small section on male endocrinology. In the opinion of the reviewer this book should prove of considerable value to the general practitioner in the treatment of such endocrinopathies as amenorrhea, dysmenorrhea, menometrorrhagia, and the climacteric. There is a very good discussion of such diagnostic adjuncts as the vaginal smear, endometrial suction curettage, and the more recent pregnancy tests. The diagnostic and therapeutic principles expressed are sound and should contribute much to the understanding and treatment of endocrine problems which are always among the most complex encountered not only by the general practitioner but by the gynecologist as well.

STUART AWEIL.

THE purpose in publishing at this time, *Progress in Gynecology*³ a 554 page volume, was "to refresh and bring up to date those medical men who have

spent the last years in the armed forces of their country and who have been removed from the practice of the diseases of women."

The book is a collection of articles contributed by 72 authors, each an authority in the field of his writing. The editors are to be congratulated on their success in persuading these representative men to contribute, for the value of a volume of this type depends upon the authority with which the many authors can speak. The wide field of interest of these contributors indicates the breadth of the field of gynecology today. In addition to many gynecologists, the authorship includes internists, obstetricians, pathologists, anatomists, general surgeons, endocrinologists, a biochemist, a hematologist, a psychiatrist, a neurologist, and a geneticist.

It has been the purpose of the editors to bring out the varied points of view. For example the section on carcinoma of the cervix includes a chapter on, "The Relation of Intraepithelial Carcinoma to Invasive Cancer of the Cervix," a chapter on, "Cancer of the Cervix, Principles of Radiation Treatment," a chapter on, "Cancer of the Cervix Vaginal Cone Method of X-ray Irradiation," a chapter on, "The Wertheim Operation," a chapter on "Pelvic Lymphadenectomy in the Treatment of Cervical Cancer," and a chapter on "Cancer of the Cervix in Pregnancy." As a result of presenting the subject in this manner it becomes apparent that the editors are attempting to convince the reader that the subject is a living one and that many gynecologists are searching for the answer along different paths.

In addition to good sound advice on the older clinical subjects given by seasoned gynecologists, the book contains chapters on newer and more controversial subjects such as culdoscopy, various endocrinological subjects and menstrual toxin. These subjects are presented by special workers in their respective fields and perhaps their ideas indicate unjustified enthusiasm. This statement is not to be construed as a criticism, for in these chapters lie stimuli for thought that every reader should receive. Although the volume was prepared primarily for the returning medical veteran who is interested in gynecology, it can be read to great advantage by all gynecologists and obstetricians. Those gynecologists who were not in the armed forces have been so engrossed in routine teaching and practice that a refresher course such as is given in this book can be taken with profit.

R. W. TE LORRE.

THIS monograph, entitled *Ulcer of the Stomach, Duodenum and Jejunum* by Dr. Ralph C. Brown, is a book of great value for the medical student and general practitioner. The author gives a short résumé of ulcer history and a brief review of present day trends in ulcer treatment. His x-ray film contours are interesting and instructive. The

¹CARDIOVASCULAR DISEASE. By De L. Scheri, M.D., F.A.C.P., and Lisa J. Boyd, M.D., F.A.C.P. Philadelphia, London, Montreal: J. B. Lippincott Co., 1947.

²OFFICE ENDOCRINOLOGY. By Robert B. Greenblatt, M.D. C.M., ed. ed. Springfield, Illinois: Charles C. Thomas, 1947.

³PROGRESS IN GYNECOLOGY. Edited by Joe V. Meigs, M.D. and Somers H. Searight, M.D. New York: Grune and Stratton, 1946.

⁴ULCER OF THE STOMACH, DUODENUM, AND JEJUNUM. By Ralph Brown, M.D. Edited by Henry A. Christian, A.M. M.D., LL.D., Sc.D. (Hon.), F.A.C.P. (Hon.) F.R.C.P. (Can.). New York: Oxford University Press, 1946.

higher than that in the pulmonary artery and finally when the size and structure of the heart is such that it can adjust itself to the altered circulation. Fluoroscopy aids in the determination of the size and structure of the heart. The heart should not be enlarged. There is no fullness of the pulmonary conus and no pulsations in the lung fields. Usually there is an absence of hilar shadows. However in patients with extensive collateral circulation these shadows may become pronounced but are composed of an aggregate of fine shadows and never show expansile pulsations.

The diagnosis of a right or left aortic arch is of importance because the position of the aorta determines the side upon which the operation is performed. A right aortic arch occurs in 20 per cent of the patients with a tetralogy of Fallot. In all such cases the innominate artery lies on the left. Indeed, the innominate if present lies on the opposite side to that upon which the aorta descends and furthermore the subclavian artery is given off from the innominate artery at a better angle for anastomosis than it is from the aorta. Therefore the operation is usually best performed on the opposite side from the aortic arch.

The course of the aorta is determined by fluoroscopy or roentgenography. Often the normal aortic knob is visible on the left. The right aortic knob is often hidden by a ribbon of the superior vena cava. Delinication of the esophagus with an opaque barium mixture usually clarifies the position of the aorta. Normally the esophagus descends in the midline and is indented to the right on its left margin whereas if the aorta arches to the right and descends upon the right, it indents the right margin of the esophagus to the left and the esophagus lies to the left of the midline. Normally in the right anterior oblique position, the esophagus hugs the cardiac shadow and is slightly displaced backward by the aorta, whereas in cases of a right aortic arch the esophagus is independent of the aorta in the right anterior oblique position.

The factors influencing selection of patients are (1) the age and size of the patient, (2) the severity of the anoxemia, and (3) the height of the red blood count, hemoglobin and hematocrit.

The optimum age for the patient is between 5 and 10 years. The use of the subclavian artery for the anastomosis is a sounder and far less dangerous operation than the use of the innominate artery. The subclavian artery in an infant is always extremely small therefore operation is not indicated in infancy unless it appears that the infant is going to die.

However if the patient is in danger of dying of anoxemia, early operation is clearly indicated. Attacks of dyspnea are common and are often severe in patients between 4 and 18 months of age. Prolonged syncope is an indication for operation.

The degree of incapacity varies greatly. With an oxygen saturation of 30 per cent most children can walk only a few feet. With an oxygen saturation of from 20 to 25 per cent few can walk at all when

it is below 20 per cent there is cause for great concern.

The height of the red blood count, hemoglobin, and hematocrit is important in the selections of the patients. If the red blood cell count is between 8 and 10 million or the hematocrit between 70 and 80 mm. the patient is in great danger of cerebral thrombosis. For such children operation is indicated. Inasmuch as dehydration increases the danger of thrombosis prior to operation these children should receive from 1 1/2 to 2 quarts of liquid a day. Twelve hours of dehydration is liable to cause cerebral thrombosis; therefore, great care should be used not to dehydrate the child the night before operation especially if the operation is not done early in the morning.

Results of operation are immediate improvement in the patient's color, prompt rise in oxygen saturation of the arterial blood and the gradual fall in red blood count, hemoglobin and hematocrit. The rapidity of the fall of the red blood cell count depends upon the amount of blood lost at operation. Once the anastomosis is established there is no need for the polycythemia. Although heretofore the surgeon venesection at the end of operation is a sound physiological procedure. It lessens the load placed on the lungs. The heart is not normal. There is a loud continuous murmur, but the patient looks like a normal individual. It is not yet possible to say how much we have increased the life span of the patient, but his enjoyment of life is greatly increased. There is gradual disappearance of clubbing of the extremities and a great increase in exercise tolerance. The child can measure his activity not in terms of walking a few feet but in terms of miles.

JOHN J. MALONEY, M.D.

Bialock, Alfred: The Technique of Creation of an Artificial Ductus Arteriosus in the Treatment of Pulmonic Stenosis. *J. Thorac. Surg.* 1947 10: 244.

The technique by which one may create an artificial ductus arteriosus in the treatment of pulmonic stenosis is described. The ages of the patients ranged from 2 months to 26 years. Operation was performed on 144 patients with an over all mortality rate of 22 per cent. This total includes several patients in whom the pulmonary artery was absent or was so abnormal that it could not be found at the time of operation.

An anastomosis was performed between the end of a systemic artery and the side of one of the two main pulmonary arteries in 118 patients, with 18 deaths a mortality of 15 per cent. The subclavian artery was used in 72 of these with 5 deaths a mortality of 7 per cent. The carotid artery was used in 11 cases with 1 death a mortality of 9 per cent. The innominate artery was employed in 36 patients with 12 deaths, a mortality of 33 per cent. The author has practically abandoned the use of the innominate artery in patients who are 2 years of age and older.

An end to end anastomosis was attempted in 13 patients with 6 deaths. In 5 of the fatal cases the pulmonary artery was too small for a satisfactory anastomosis. In the remaining case the condition was improved following the operation but death occurred suddenly 6 months later from an unexplained cause.

With 1 exception all of the patients in whom an anastomosis was performed and who are living are believed to have been benefited. In the exception the intima of the subclavian artery was damaged and thrombosis occurred. There has been no mediastinitis, no empyema, no severe bleeding from the anastomotic line and thus far no bacterial endarteritis.

JOHN J. MALONEY, M.D.

ESOPHAGUS AND MEDIASTINUM

Frink, Norman William: Spontaneous Rupture of the Esophagus. *J. Thorac. Surg.* 9:47 6-30

A case is presented in which the patient recovered following a spontaneous rupture of a previously normal esophagus.

Diagnosis and treatment are discussed.

The reason that patients with spontaneous rupture of the esophagus die so quickly is still unexplained. Unquestionably the sudden forceful onslaught of chemical and infective mediastinitis and pleuritis is the most important factor. Just what effect this produces on the adjacent sympathetic nerves and plexuses is largely conjecture. The patient may survive the first few days, if the infection is not overwhelming, only to succumb to a massive hemorrhage from the site of the rupture when he seems to be on the road to recovery.

Because the condition is so rare and so few cases have been diagnosed during life, the literature contains but few recommendations as to therapy. Williams and Boyd suggested early thoracotomy drainage. This is also suggested by Vinson. Benson and Penberthy reported a case of rupture of an esophageal ulcer into the pleural cavity which was treated by closed drainage of the empyema; the patient recovered. Eliason and Welky recommend posterior mediastinotomy. This would appear to be the procedure of choice if the infection were limited to the mediastinum. If an empyema is present, the author recommends closed intercostal drainage preferably with constant suction. This would tide the patient over his initial toxicity. When his condition had improved sufficiently and it was believed that the mediastinum was well fixed, open thoracotomy would be done.

Surgical repair of the esophagus following spontaneous rupture has been attempted but once. In this instance the patient expired 31 hours after operation. This is truly a formidable procedure to perform on a desperately ill patient, and to be successful would have to be done within a few hours after the rupture had occurred; however this is when an accurate diagnosis is most difficult. It would seem that these early hours might better be spent in attempt-

ing to resuscitate the patient by means of sedation, oxygen, parenteral fluids, and transfusions, with surgery limited to simple drainage of the infected region.

In the light of our present knowledge of chemotherapy the administration of penicillin in large doses is definitely indicated. At the same time, one of the sulfonamide salts given intravenously might be a worth while adjunct to penicillin. The efficacy of these drugs, of course, depends entirely upon the bacterial flora present.

Esophagoscopy is not recommended. Observation of a swallow of barium sulfate mixture under the fluoroscopic screen would give the same diagnostic aid as esophagoscopy with none of the disadvantages of the latter.

The use of a nasal feeding tube is open to strong criticism because of the possibility of producing further injury by the passage of the tube and the irritation the tube would theoretically produce by residing over the site of rupture. Possibly these dangers are not as great as they might seem. If it is used a chest roentgenogram should be taken immediately after the tube is passed to determine its position. Vinson has reported a case in which the tube was visualized looped outside of the esophagus into the mediastinum.

Whether or not a gastrostomy or jejunostomy should be done for feeding purposes is a moot question. Again, this is a major operative procedure for a critically ill patient. Probably those patients who survive the first few days would recover without it if a fatal hemorrhage did not intervene. The patient could well be supported during the initial few days with fluids given intravenously and subcutaneously. As soon as the patient's condition permits it is recommended that a jejunostomy be performed. This would place the esophagus at rest as much as possible while at the same time it would provide a means of supplying much needed nutrition. This is much to be preferred to gastrostomy as it would obviate the danger of a reflux of food through the rent in the esophagus. In a few cases coming to autopsy it was noted that the esophageal rupture extends into the stomach. It thus seems advisable to keep the stomach, as well as the esophagus, as empty as possible.

It would be well to have compatible blood kept in readiness in a "bank" or refrigerator so that it might be administered with no delay if hemorrhage occurs. The danger of this secondary hemorrhage is greatest during the first week or two. If the blood is ready and instantly available, its use may well prevent a fatality.

If the patient recovers, he should be checked at intervals of a few weeks or months by means of barium studies of the esophagus because of the possibility of subsequent stricture formation. If a stricture did occur treatment could be started early before obstruction intervened.

With the exception of 3 cases mentioned by Graham, this is the first case of recovery following spontaneous rupture of the esophagus to be reported. If the entity of rupture of the esophagus is borne in

mind many more cases should be diagnosed before death. Undoubtedly the mortality rate will always be high but if the diagnosis can be made early enough and prompt treatment begun more and more patients should recover.

JOHN J. MALONEY M.D.

Bozzi, E., and Cova, P. L.: Polypoid Tumors of the Esophagus (Sul tumori polipoidi dell'esofago). *Radiol. med.* Milano 1947 33 161

In a 2 year period at the National Institute for the Treatment of Tumors in Milan 7 esophageal polypoid tumors were observed. Six of these could be examined histologically, but the remaining growth broke off and disappeared before endoscopy could be instituted. In 4 of the 6 patients the histologic diagnosis was polymorphocellular sarcoma, adenocarcinoma papillary fibroepithelioma of Malpighian cell type (precancerous stage) and nondifferentiated carcinoma, respectively. In the remaining 2 histologically studied cases the diagnosis could not be confirmed with certainty because in the first endoscopic manipulations the pedicles were so injured that the tumor broke off and fell into the stomach before more complete biopsy studies could be done. One of these was considered to be a fibroma or a fibromyoma (benign) and the other exhibited some leucoplasmia and was thought to be a simple chronic pharyngitis with polypoid development.

In none of the 3 benign cases was the tumor removed and yet the patients are still alive and well after 1 year 1 year and 3 years respectively. Of the 4 malignant cases, 2 received no treatment because of the grave condition of the patient (hemorrhage, exhaustion), and the other 2 received roentgen therapy. In the case of adenocarcinoma 8,000 roentgens produced an initial improvement with regression of the tumor 2 months later however the

tumor returned with severe manifestations of dysphagia and pain which ended in death. At present all 4 patients with malignancies are dead. Nevertheless, the irradiated cases manifested an evident radiosensitivity of the tumor cells.

From their own experience—meager it is true—and a rather fragmentary review of the literature, the authors conclude that there are no constant signs either roentgenological or endoscopic which permit a certain differentiation between the benign and the malignant polyp. This differentiation will ultimately rest upon biopsy and is particularly important because of the difference in prognosis and treatment of the two conditions. For the malignant case the authors prefer roentgen therapy while they attempt removal of the benign tumor. However they concede that, even in the case of a malignant new growth the removal of the whole or a part of the intracophageal obstructing mass may afford palliative relief. Because of the necessity of respecting the thinned and stretched esophageal wall at the point of attachment of the polyp the authors believe that the deliberate though not brutal endoscopic manhandling of the pedicle with the intent of injuring it to the point where it will later give way spontaneously is justified.

Surgical intervention by the external route is to be considered only in the presence of a benign polyp of particularly voluminous character. In the malignant case it is admitted that there is a chance by removing the entire circumference of the esophagus itself of removing the condition before it has spread through the esophageal walls however such an operation is to be attempted only in special centers with the aid of especially experienced personnel.

JOHN W. BRENNAN M.D.

An end to end anastomosis was attempted in 33 patients with 6 deaths. In 5 of the fatal cases the pulmonary artery was too small for a satisfactory anastomosis. In the remaining case the condition was improved following the operation but death occurred suddenly 6 months later from an unexplained cause.

With 1 exception all of the patients in whom an anastomosis was performed and who are living are believed to have been benefited. In the exception the intima of the subclavian artery was damaged and thrombosis occurred. There has been no mediastinitis, no empyema, no severe bleeding from the anastomotic line and thus far no bacterial enteritis.

JONES I. MALOYEV M.D.

ESOPHAGUS AND MEDIASTINUM

Frink, Norman Williams: Spontaneous Rupture of the Esophagus. *J. Thorac. Surg.* 947 16 191

A case is presented in which the patient recovered following a spontaneous rupture of a previously normal esophagus.

Diagnosis and treatment are discussed.

The reason that patients with spontaneous rupture of the esophagus die so quickly is still unexplained. Unquestionably the sudden forceful onslaught of chemical and infective mediastinitis and pleuritis is the most important factor. Just what effect this produces on the adjacent sympathetic nerves and plexuses is largely conjecture. The patient may survive the first few days, if the infection is not over whelming, only to succumb to a massive hemorrhage from the site of the rupture when he seems to be on the road to recovery.

Because the condition is so rare and so few cases have been diagnosed during life, the literature contains but few recommendations as to therapy. Williams and Boyd suggested early thoracotomy drainage. This is also suggested by Vinson. Benson and Penberthy reported a case of rupture of an esophageal ulcer into the pleural cavity which was treated by closed drainage of the empyema; the patient recovered. Eliason and Welky recommend posterior mediastinotomy. This would appear to be the procedure of choice if the infection were limited to the mediastinum. If an empyema is present the author recommends closed intercostal drainage preferably with constant suction. This would tide the patient over his initial toxicity. When his condition had improved sufficiently and it was believed that the mediastinum was well fixed, open thoracotomy would be done.

Surgical repair of the esophagus following spontaneous rupture has been attempted but once. In this instance the patient expired 2 hours after operation. This is truly a formidable procedure to perform on a desperately ill patient, and to be successful would have to be done within a few hours after the rupture had occurred; however this is when an accurate diagnosis is most difficult. It would seem that these early hours might better be spent in attempt-

ing to resuscitate the patient by means of sedation, oxygen, parenteral fluids, and transfusions, with surgery limited to simple drainage of the infected region.

In the light of our present knowledge of chemotherapy the administration of penicillin in large doses is definitely indicated. At the same time, one of the sulfonamide salts given intravenously might be a worth while adjunct to penicillin. The efficacy of these drugs, of course, depends entirely upon the bacterial flora present.

Esophagoscopy is not recommended. Observation of a swallow of barium sulfate mixture under the fluoroscopic screen would give the same diagnostic aid as esophagoscopy with none of the disadvantages of the latter.

The use of a nasal feeding tube is open to strong criticism because of the possibility of producing further injury by the passage of the tube and the irritation the tube would theoretically produce by residing over the site of rupture. Possibly these dangers are not as great as they might seem. If it is used a chest roentgenogram should be taken immediately after the tube is passed to determine its position. Vinson has reported a case in which the tube was visualized looped outside of the esophagus into the mediastinum.

Whether or not a gastrostomy or jejunostomy should be done for feeding purposes is a moot question. Again, this is a major operative procedure for a critically ill patient. Probably those patients who survive the first few days would recover without it if a fatal hemorrhage did not intervene. The patient could well be supported during the initial few days with fluids given intravenously and subcutaneously. As soon as the patient's condition permits, it is recommended that a jejunostomy be performed. This would place the esophagus at rest as much as possible while at the same time it would provide a means of supplying much needed nutrition. This is much to be preferred to gastrostomy as it would obviate the danger of a reflux of food through the rent in the esophagus. In a few cases coming to autopsy it was noted that the esophageal rupture extends into the stomach. It thus seems advisable to keep the stomach, as well as the esophagus, as empty as possible.

It would be well to have compatible blood kept in readiness in a "bank" or refrigerator so that it might be administered with no delay if hemorrhage occurs. The danger of this secondary hemorrhage is greatest during the first week or two. If the blood is ready and instantly available its use may well prevent a fatality.

If the patient recovers, he should be checked at intervals of a few weeks or months by means of barium studies of the esophagus because of the possibility of subsequent stricture formation. If a stricture did occur treatment could be started early before obstruction intervened.

With the exception of 2 cases mentioned by Graham, this is the first case of recovery following spontaneous rupture of the esophagus to be reported. If the entity of rupture of the esophagus is borne in

mind many more cases should be diagnosed before death. Undoubtedly the mortality rate will always be high but if the diagnosis can be made early enough and prompt treatment begun more and more patients should recover.

JOHN J. MALONEY M.D.

Boazi E., and Cova, P. L.: Polypoid Tumors of the Esophagus (Sul tumori polipoidi dell'esofago). *Radiol. med.* Milano, 1947 33 161.

In a 2 year period at the National Institute for the Treatment of Tumors in Milan, 7 esophageal polypoid tumors were observed. Six of these could be examined histologically but the remaining growth broke off and disappeared before endoscopy could be instituted. In 4 of the 6 patients the histologic diagnosis was polymorphocellular sarcoma, adenocarcinoma, papillary fibroepithelioma of Malpighian cell type (precancerous stage) and nondifferentiated carcinoma, respectively. In the remaining 3 histologically studied cases the diagnosis could not be confirmed with certainty because in the first endoscopic manipulations the pedicles were so injured that the tumor broke off and fell into the stomach before more complete biopsy studies could be done. One of these was considered to be a fibroma or a fibromyoma (benign) and the other exhibited some leucoplaxia and was thought to be a simple chronic pharyngitis with polypoid development.

In none of the 3 benign cases was the tumor removed and yet the patients are still alive and well after 1 year, 1 year and 3 years respectively. Of the 4 malignant cases, 1 received no treatment because of the grave condition of the patient (hemorrhage, exhaustion), and the other 2 received roentgen therapy. In the case of adenocarcinoma, 8,000 roentgens produced an initial improvement with regression of the tumor 2 months later, however the

tumor returned with severe manifestations of dysphagia and pain which ended in death. At present all 4 patients with malignancies are dead. Nevertheless the irradiated cases manifested an evident radiosensitivity of the tumor cells.

From their own experience—meager it is true—and a rather fragmentary review of the literature, the authors conclude that there are no constant signs, either roentgenological or endoscopic which permit a certain differentiation between the benign and the malignant polyp. This differentiation will ultimately rest upon biopsy and is particularly important because of the difference in prognosis and treatment of the two conditions. For the malignant case the authors prefer roentgen therapy while they attempt removal of the benign tumor. However they concede that, even in the case of a malignant new growth the removal of the whole or a part of the intracaseal obstructing mass may afford palliative relief. Because of the necessity of respecting the thinned and stretched esophageal wall at the point of attachment of the polyp the authors believe that the deliberate though not brutal endoscopic manhandling of the pedicle with the intent of injuring it to the point where it will later give way spontaneously is justified.

Surgical intervention by the external route is to be considered only in the presence of a benign polyp of particularly voluminous character. In the external approach in the malignant case it is admitted that there is a chance by removing the entire circumference of the esophagus itself of removing the condition before it has spread through the esophageal walls; however such an operation is to be attempted only in special centers with the aid of especially experienced personnel.

JOHN W. BRENNAN M.D.

SURGERY OF THE ABDOMEN

ABDOMINAL WALL AND PERITONEUM

Gaston, Eugene A.: Living Fascial Sutures in Inguinal Herniorrhaphy. *Arch. Surg.*, 1947 54 474.

The author presents a personal series of 201 inguinal hernias treated most proficiently by the use of living fascial sutures. His follow up statistics are carefully documented and his recurrence rate is only 1.74 per cent.

The anatomy and physiology of the inguinal region are clearly and simply reviewed, particularly in the light of the recent work of Anson and McVay. The pathologic changes in both direct and indirect inguinal hernias are discussed and their structural similarities in regard to herniorrhaphy are stressed.

A technique for the surgical repair of inguinal hernias is explicitly described in which the following points are significantly emphasized: (a) an adequate incision, (b) ample exposure and painstaking repair of the transversalis fascia, and (c) broad approximation of the internal oblique muscle to the inguinal ligament, lateral as well as medial to the internal ring, by means of a combination of silk and living fascial sutures. The fascia used is a strip of the external oblique aponeurosis as shown in Figures 1 and 2.

The operative mortality rate was 0.5 per cent: 1 death occurring in a patient with a strangulated direct hernia who had peritonitis and a pulmonary infarct.

These personal case records kept by the author were indeed conspicuous by their comprehensiveness and detail. For example the difference in the insertions of the internal oblique muscle was care-

fully noted in most cases, as was the condition of this muscle relative to age, duration of the hernia, and the wearing of a truss.

Complications are discussed and a detailed summary of results is unequivocal and to the point.

EDWARD F. LEWISON, M.D.

GASTROINTESTINAL TRACT

Maimon, S. N., Bartlett, J. P., Huemphreys, E. M. and Palmer, W. L.: Giant Hypertrophic Gastritis. *Gastroenterology* 1947 8 297.

A review of 5765 gastroscopic examinations carried out at the University of Chicago Clinics revealed 6 cases of giant hypertrophic gastritis verified at operation. Four other cases were diagnosed on the basis of x ray and gastroscopic findings, 3 being confirmed by operation—an incidence of 0.17 per cent. The cause is unknown. The gastroscopic findings, the pathology and the histologic observations in each of the cases are discussed in detail.

From the standpoint of the clinical diagnosis, the differentiation of giant hypertrophic gastritis from carcinoma by roentgenography or by gastroscopy in the cases presented was unsatisfactory. In 2 of the 6 cases of giant hypertrophic gastritis a superimposed hyperplastic polyp formation was observed. Considerable difficulty was encountered in differentiating this condition from neoplasm. Anatomically roentgenologically and gastroscopically the resemblance of the gastric folds to the convolutions of the brain is striking and is perhaps the most salient feature.

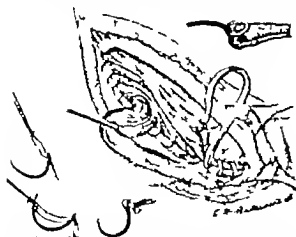


Fig. 1 (Gaston) Fascial suture used to approximate the internal oblique muscle to the inguinal ligament superficial to the interrupted sutures. The inset shows the broad approximation thus established.

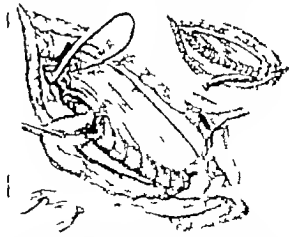


Fig. 2 (Gaston) A second fascial suture being inserted lateral to the internal inguinal ring. The inset shows complete closure of the inguinal defect after division of the spermatic cord preparatory to orchiectomy.

ing mattress sutures passing through the liver substance proximal to the line of incision in the liver. These are placed prior to the incision of the liver for the purpose of immediate control of bleeding by compression.

The author reports 3 cases. In all 3 the tumors were hepatomas, liver cell tumors of low grade malignancy. The first patient, a man of 73 years who is alive and well after 22 months, had a resection of the entire left lobe. Resection of the left lobe proved to be easier technically than resections of portions of the right lobe. In the second case that of a child 3 years of age a huge tumor of the left lobe and invading the right lobe was successfully resected but the patient died 6 months later with recurrence of the tumor. The third patient, a child 20 months of age, had a much smaller tumor of the right lobe, and had a much more favorable prognosis.

LEE PULLEN M D

Hoyne, Robert M. and Kernohan, James W.: Primary Carcinoma of the Liver; A Study of 31 Cases. *Arch. Int. M.*, 1947 79 532.

Primary carcinoma of the liver is a rare disease. Thirty-one cases have been found in 16,303 autopsies at the Mayo Clinic, an incidence of 0.19 per cent. Six of these cases had been previously reported in the literature. The disease occurs most commonly in the Orient and South Africa. A series of reports collected from the literature reveals an incidence of 0.227 per cent among the white skinned races of Europe and America and an incidence of 0.083 per cent among the Asiatic and African races. This increased tendency of the disease to afflict the latter peoples is believed to be due to the high geographic incidence of schistosomiasis and clonorchiasis among these peoples and to the chronic irritation of the liver caused by these parasitic infections.

Primary carcinoma of the liver is a disease of older persons. In most of the authors' cases the lesion occurred in the fifth, sixth and seventh decades of life. In 23 of these 31 cases the disease occurred in males the sex which is more frequently afflicted. Primary carcinomas of the liver arising from liver cells are called "hepatomas" and those arising from bile ductules are called "cholangiomas." Reports of hepatomas in the literature far exceed those of cholangiomas. In 20 of the 31 cases the tumors were hepatomas and in 11 they were cholangiomas. Cirrhosis frequently is associated with primary carcinoma of the liver, and undoubtedly is an important causative factor. In 15 of the 20 hepatomas (75 per cent) cirrhosis was associated but it was present in only 2 of the 11 cases of cholangiomas (18.2 per cent).

It is still debatable whether the incidence of primary carcinoma of the liver is any greater in the presence of hemochromatosis than it is when nonpigmentary cirrhosis alone is present. There are no pathognomonic clinical or laboratory signs or symptoms in these cases, and the diagnosis is rarely made before death of the patient. The most significant symptoms and signs in the cases were emaciation

abdominal distention with ascites abdominal pain edema of the ankles, jaundice, and a palpable abdominal tumor.

Cross distinction between hepatoma and cholangioma usually is difficult, and the final diagnosis must be made histologically. The question of multicentric or unicentric origin of these tumors is still debatable; most authors favor the latter view. Eleven of the 20 hepatomas were characterized by obvious invasion of the blood vessels. The early vascular involvement is thought to cause the intrahepatic metastasis so often seen in the presence of hepatoma. Tumor thrombosis of the inferior vena cava and right auricle may accompany these tumors. In 21 of the 31 cases, 67.7 per cent, extrahepatic metastasis was present. Cholangioma as a rule metastasizes earlier and more frequently than does hepatoma. The tumors under consideration grow exceedingly rapidly and the prognosis usually is hopeless. Early surgical resection of the liver offers the only chance for cure in these cases.

Baker H. L. and Caldwell D. W.: Lesions of the Ampulla of Vater. *Surgery* 1947 21 523.

The report concerns itself with 4 different lesions of the ampulla of Vater which have been observed in the past 3 years. The conditions are (1) cystic dilatation of the common bile duct (2) benign papilloma of the ampulla, (3) adenocarcinoma of the ampulla and (4) ulcer of the duodenum affecting the ampulla.

It is well to recognize that only at operation can cystic dilatation of the common bile duct be regularly differentiated from the more frequent, less hopeful malignant neoplasms. The condition appears almost entirely in childhood or young adulthood and is most frequent in females under the age of 25 years. Rolleston suggested the causes of cystic dilatation to be (a) idiopathic, that is, no obvious obstruction considered to be due to a primary inherited weakness of the wall of the duct, and (b) obstruction at the distal end of the common duct due to congenital stricture, trauma, stones or surgery and infections such as syphilis, typhoid, and those resulting from a more heterogeneous group of bacteria from the intestine. The condition is accompanied by symptoms and findings such as recurrent jaundice and occasionally paroxysmal pain.

The importance of benign papillomas of the ampulla of Vater is obvious inasmuch as their differentiation from early malignant growths is not possible except at the time of surgical exploration. The further importance of such tumors is emphasized when one realizes that 70 per cent of the also rare carcinomas of the duodenum are located at the ampulla.

Accepted by some is the belief that primary carcinomas of the region of the ampulla of Vater start as benign papillomas. This is because of the similarity of the gross and microscopic appearance of benign tumors to that of the low grade papillary carcinomas. The question has been raised as to the possibility that ulceration of the periampullar duodenum is the precursor of such malignancies.

3. The annular type of carcinoma occurs somewhat more frequently in the left colon than in the right colon.

In the light of the current emphasis that salvation in malignant disease rests in the last analysis, with the patient and depends upon his consulting the doctor early, it is as ironic as it is tragic that 11, or 22 per cent, of these patients did seek medical aid at intervals varying from 1 to 18 months prior to obstruction. Three of them were told to take purgatives; 1 was given medicine; 1 was treated 7 months for dysentery; 1 was told he had a gastric ulcer; and another was told that the symptoms were due to "womb trouble."

Four had been operated upon—2 had appendectomies 2 weeks and 15 months before entering the hospital; 1 had a cecostomy for "volvulus" of the cecum 3 months prior; and 1 had had "release of adhesions" 18 months prior. FRANK B. QUINN, M.D.

LIVER, GALL BLADDER, PANCREAS, AND SPLEEN

Snell, A. M.: Jaundiced Patients. *J Am M Ass* 1947 133 1175

Success in the management of jaundiced patients appears to depend on increased accuracy of diagnosis, especially in the differentiation of obstructive from hepatocellular jaundice. The value of profile hepatic functional studies, especially those concerned with urobilinogen metabolism, is discussed.

The indications for surgical intervention in cases of jaundice include (1) the proved or presumed presence of stone; (2) the development of jaundice after cholecystectomy; (3) the presence of associated biliary fistulas; and (4) proved complete acholia. The relative contraindications for surgical treatment are discussed with reference to the signs and symptoms of serious primary or secondary hepatocellular injury.

The established principles of medical treatment include a highly nutritious diet, the maintenance of normal hemoglobin and protein levels, the use of vitamins for the correction of specific deficiencies, and the employment of lipotropic substances and liver extract.

Ferguson, L. K., and Anderson, R. K.: Amebic Liver Abscess in Service Personnel. *Gastroenterology* 1947 8 35

With the return of the armed forces who have been on duty in areas in which the incidence of amebiasis is high, the appearance of the disease and its complications may be expected to increase.

From a surgical point of view the most important complication of amebiasis is liver abscess. Many abscesses progress, without recognition, to more serious complications. Perforation through the diaphragm to involve the pleural cavity is usually a late complication and was not seen in the authors' cases. The more common complication is secondary infection of the abscess with pyogenic organisms. Frequently the acute symptoms of a pyogenic infec-

tion are the presenting complaints. In the present series, the time from the amebic colonic symptoms to those of liver abscess varied from 1 month to 1 year.

The authors have seen no extension of the amebic or infective process from aspiration or drainage in cases in which emetine and penicillin were used in the postoperative period.

A two stage transdiaphragmatic procedure is used. The abscess is located by exploring with an aspirating needle, under local anesthesia, at the site of the most acute local tenderness produced by fist percussion or deep intercostal pressure. A large, long needle should be used. When pus is found, a small amount is aspirated, enough to relieve tension in the abscess, and to serve for smear and bacteriologic study. The needle is detached from the syringe and left in place, and the rib above or below the needle is resected subperiosteally for a distance of about 2 inches. Care should be taken not to injure the underlying pleura. The wound thus produced is tightly packed with iodoform gauze, the aspiration needle is then removed and a tight dressing applied. After an interval of 3 or 4 days, the patient is returned to the operating room and, under local anesthesia, the iodoform packing is removed. The parietal and diaphragmatic pleuras are now adherent, and transdiaphragmatic drainage may be carried out without danger of infecting the pleural cavity. The exploring needle is again used to locate the abscess cavity and with this as a guide, the abscess is opened through the diaphragm. Once pus is located an aspirator is used to evacuate the contents of the cavity and the opening is enlarged sufficient to permit the introduction of one or two large rubber drainage tubes. An iodoform pack is used to control the oozes by introducing it along the tubes into the abscess cavity and in the wound.

The diagnosis is not always easy because the demonstration of ameba in the stools may be difficult, the history indefinite, and the period from dysentery to abscess considerably long.

Four case reports are included which illustrate the difficulties of diagnosis. JOSEPH GUTER, M.D.

Dockert, J. W., and Montgomery, H. G.: Resection of Primary Liver Tumors. *Surgery* 1947 455

Recent advances in our knowledge of the physiology of the liver and gradual accumulation of clinical data from reports of surgical cases have fairly well eliminated the fear of producing insufficiency by removal of large portions of this organ. The right and left branches of the hepatic artery anastomose freely so that if either main branch is divided during the course of resection, the intact branch can adequately supply the remaining portions of the liver. However, extreme care must be taken to avoid damage to the main hepatic artery. Even temporary compression of the hepatic artery produces symptoms of shock and consequently this method of control of hemorrhage from the liver is unsuitable.

The method of controlling hemorrhage described by Pickrell and Clay is the use of a line of interlock

most always accompanies colic and icterus affords some basis for this statement together with the fact that various degrees of inflammation were found in all specimens which the authors examined.

Eppinger states that in certain dyskinesias extravasation of plasma at the level of the terminal common duct can cause obliteration of the duct. Icterus in effect is caused by an edematous tumefaction of the ampulla of Vater. This process occurs whether or not calculi are present in the duct. Since the symptoms usually regress in spite of the persistence of a stone it would appear that when no impaction is present the calculi are not the direct cause of the obstruction. The dilatation of the duct is dependent upon the degree of hypertrophy of the sphincter. Stones, when present act only indirectly by favoring the change in the musculature. Their role is secondary since dilatation frequently continues after the stone is removed.

ORVILLE F. GRIMM, M.D.

Lagerlöf, Henrik: Choledochal Denervation in Biliary Dyskinesia. *Läkareskrift* 1947 95 297

Reich in 1940 suggested that the pain of biliary dyskinesia might be relieved by sectioning the intrinsic nerves of the biliary tract thereby inducing a paralysis of the sphincter of Oddi with consequent decrease of pressure in the common bile duct. In one cholecystectomized patient he showed that the intracholedochal pressure was reduced from 125 millimeters of water before to 85 millimeters 10 days after operation. Injection of morphine caused a precipitate rise to 120 millimeters, but because this was not maintained for several hours he concluded that the residual pressure of 85 millimeters was the result of duodenal tonus.

In the present study 15 cases of biliary dyskinesia were investigated. All but one of the patients had previously undergone cholecystectomy and the second operation was primarily done to exclude stones in the common duct. The diagnosis of biliary dyskinesia was made on the similarity between spontaneously occurring biliary colic and pain induced by morphine. Also since theoretically the simultaneous injection of morphine and secretin should lead to spasm of the sphincter of Oddi status in the pancreatic and biliary ducts and resultant pain and elevation of the serum amylase and bilirubin a 'morphine-secretin' test was done before and after choledochal denervation.

Choledochal denervation as carried out in all 15 cases consisted of the removal of a 2 cm. section from a rather large nerve trunk which was found to arise from the celiac plexus. This nerve which has been identified in anatomical studies (Latarjet, Perman) as the 'nerf pancréatocolédochéen,' courses behind the portal vein to the common duct in the area of the neck of the gall bladder and from this point descends dorsally and medially to the duodenum. In all cases common duct exploration was carried out as well as section of the contiguous nerve trunk.

Following the choledochal denervation pain was relieved in 14 of the 15 patients and the rise of serum amylase and bilirubin in response to morphine and secretin was found to be lower than preoperatively. Although the relief of pain postoperatively may be due to interruption of the pain pathways and/or decrease of the tone of Oddi's sphincter, the author believes that the results of the morphine-secretin test indicate that the sphincter contracts less strongly.

The effects of choledochal denervation lasted only a few weeks to months, probably because of regeneration of the nerve fibers hence the operation is of little practical value and is not advised save in cases in which the biliary tract is explored on suspicion of choledochal stone or inflammatory changes in the remnant of the cystic duct and in which no pathologic process is found.

WAYNE CAMERON, M.D.

Koller, Oddmund: Acute Interstitial Pancreatitis Provoked by Hemolytic Streptococci In Infected Food (Fish). *Acta chir scand* 1947 95 358.

The author describes in detail 2 fatal cases of acute, interstitial nonpurulent pancreatitis due to hemolytic streptococci isolated from specimens taken at operation and at postmortem examination. Both patients were elderly men who had shared board and lodging and who developed at about the same time violent abdominal pain radiating to the back and accompanied by vomiting. Death occurred in 3 and 5 days, respectively and at autopsy the findings in both cases were remarkably similar. In both there was a slight cloudy peritoneal exudate, a gelatinous edema of the duodenum edema and hyperemia of the pancreas from which short chain hemolytic streptococci were isolated and cerebral edema.

Follow up inquiries revealed that 3 members of a household had eaten warmed-over halibut and had become ill the following day. Death occurred as described in 2 of the members, but the third person after a 24-hour bout of abdominal pain and diarrhea had recovered. Nearly 3 weeks after his illness the serum of this patient showed a high antistreptolysin titer which denoted a recent severe streptococcal infection.

The pathologic-anatomical picture of the 2 cases described is similar to that of Zopf's pancreatitis edematosa and Elman's acute interstitial pancreatitis which is usually interpreted as an aseptic process possibly as the initial stage of acute pancreatic necrosis. The author points out that as the etiology of acute pancreatic necrosis is obscure, more careful bacteriological examinations should be carried out in cases of disease of this viscus particularly as it has been shown experimentally that bacteria may play a decisive or a contributory part in activating the pancreatic enzymes. He considers it not illogical therefore to consider chemotherapy with a view to preventing secondary infectious with consequent intensification of the process and septicemia.

WAYNE CAMERON, M.D.

Most of the papillomas are of a columnar epithelial type and not of glandular formation. This is in contradistinction to the glandular type of formation of the carcinomas. The tumors are usually very small. They may be cystic or solid and consist usually of small hard white masses, often readily mistaken for an impacted calculus or a carcinoma. The most common symptoms and findings are those of painless jaundice, generalised pruritis, weight loss (due to retention of bile and loss of external pancreatic secretion) hepatomegaly fever and diarrhea.

Ampullar carcinoma is relatively rare. Adenocarcinomas of the region of the ampulla of Vater are the most common in this area. On gross examination *in situ*, these may readily be mistaken for small calculi or benign neoplasms. Therefore, they must be most closely scrutinized and biopsy made if at all possible.

Ulcer of the duodenum affecting the ampulla of Vater is a rather rare condition which may come about as the result of a primary ulcer in this region or as the result of marginal ulcers following various gastroduodenal anastomoses for intractable ulcers of the stomach or first portion of the duodenum.

The author presented 4 cases, each of a different pathologic nature but with marked similarity of symptoms and findings, such as persistent jaundice, pruritis, anorexia, weight loss, and stool color changes. Because of such similarity and the great difference in prognosis, the following conclusion is expounded.

In those patients with biliary tract obstruction producing symptoms and physical findings which cannot be readily explained by the simpler less hazardous means, the surgeon is thoroughly justified in exploring the ampulla of Vater transduodenally, and, in agreement with Brunschwig, transduodenal resection with reimplantation of the ducts with or without internal biliary drainage should be the choice for ampullar carcinomas of 1 cm. or less in diameter which appear quite circumscribed or show little gross evidence of infiltration and which do not extend into the pancreatic tissue.

LEE POLLEY, M.D.

Bergolts, A. J., and Negri, A.: Disease of the Terminal Common Duct (La maladie du cholédoque terminal). *Rev. chir. Par.* 1947 66 65

The literature frequently makes mention of a functional alteration in the sphincter of Oddi as the cause of the persistence of symptoms following operations on the biliary tract, most often following cholecystectomy. Sphincteric spasm no doubt exists but it does not account for all the postoperative difficulties not otherwise due to such entities as residual lithiasis, pericholangitis, cicatricial stenoses, or extrinsic pathological processes. The more or less permanent nature of the symptoms, the inability to observe sphincteric spasm by cholangiography, the frequency of fever which precedes or accompanies the syndrome, and the futility of the use of biliary hypotensives all militate against a spasmodic mechanism as the primary cause.

Organic lesions in the duodenal portion of the common duct have been noted and studied micro-

scopically by the authors. The primary lesion consists in hypertrophy and hyperplasia of the muscle of Oddi. The hypertrophy assumes a concentric form and thereby infringes upon the lumen of the duct. This alteration usually is caused mechanically from irritation derived from an adjacent inflammatory process such as duodenitis or diverticulitis. The hypertrophy is always followed or accompanied by a glandular hyperplasia which can become almost adenomatous. The hyperplasia develops toward the lumen so that in certain instances the lumen is so reduced that it almost disappears from the microscopic sections.

Inflammatory infiltration along with the fibrous involvement of the muscular tissue and mucosa is likewise notable. In all except 2 of the authors' cases, the inflammation was chronic and most marked in the mucosa which suggests that the mucosal infiltration is primary and the muscular infiltration secondary. In the later phases of the inflammatory process the deposition of additional tissue by fibrosis causes thickening and induration of the duct. Much of the glandular tissue becomes encased in fibrous tissue.

The presence of tissue edema in the distal common duct was striking in the authors' cases, suggesting that the participation of the serous process perhaps completes an otherwise incomplete obstruction.

This pathologic picture is produced both by lesions of the biliary tract and by lesions of adjacent organs. The presence of calculi in the common duct does not necessarily cause complete obstruction. Unless they promote an inflammatory response or become impacted their significance as a cause of obstruction is decreased.

Duodenal disease particularly ulcer duodenitis and diverticulitis may also provoke gross alterations in the terminal bile duct. Duodenitis, irrespective of origin, by progress of the irritation up the common duct, favors thickening and inflammation of its terminal portion. Strauss mentions 29 cases of chronic biliary stasis without stones which were caused by extension of an inflammation of the duodenum into the common duct with the production of thickening and fibrosis. Diverticulitis causes obstruction in a similar manner. In 1 of the authors' cases, complete obstruction of the common duct was caused by an infected diverticulum adjacent to the ampulla of Vater.

Inflammatory diseases of the pancreas which may partially stenose the common duct by compression may also cause anatomical changes in the terminal duct by extension of the inflammation.

The authors suggest that such anatomical changes exist in many patients complaining of biliary disease with or without lithiasis. Their existence constitutes an incomplete obstruction which will allow the passage of bile unless the balance is upset by some inflammatory process. The inflammation provokes congestion and edema which reinforces the pre-existent obstruction, and the passage of bile is completely blocked. The rise in temperature which al-

section on diagnosis and differential diagnosis is excellent. Dr. Brown's description of the exacting treatment of ulcer that has proved its value through the years should be especially studied. In the reviewer's experience no ulcer has been treated more unsatisfactorily than has any other condition met with in internal medicine. Ulcer is not a disease that can be neglected or slighted if it is to be cured. The excellent results obtained on Dr. Brown's service and the few intractable cases requiring surgery speak well for the efficacy of his therapeutic measures. The book is concise, well organized and outlines the management of patients with ulcer and outlines its value through the years.

A. J. Atkinson

AFTER 5 years Drs. Mizer and Israel have made available a second edition of *Mental Disorders and Slerity*.¹ The new edition is the same attractively printed and readable volume as its predecessor with revisions and additions to the material from which the authors draw liberally to substantiate their text.

The treatment of the subject closely follows the first edition. An excellent bibliography of the literature is included in a group of

The treatment of the subject closely follows that of the first edition. An enlarged section on the physiology of the ovary and pituitary is followed by a group of chapters on amenorrhoea, uterine bleeding and sterility. A discussion of artificial insemination has been added and in the informative chapter on male sterility Dr Charles V. Charney has introduced many excellent illustrations of testicular pathology. The appendix now contains a more complete summary of most of the available commercial endocrine preparations.

The chapter bibliographies in general are comprehensive reference lists in general, and in the case of the subject matter of the chapters, they contain recent references.

The chapter bibliographies in general will serve as comprehensive reference lists on almost every facet of the subject matter discussed. The omission of certain sharp focus. One finds no mention of a possible luteotropic factor in the section on pituitary physiology, and some investigators will not be convinced by the authors' statement in sum-
marizing the therapy for dysfunctional flow that, "Since neither estrogen nor progesterin is capable of enhancing the pituitary-ovarian mechanism, it is difficult to rationalize such treatment. Drs. Mincer and Israel report considerable success in treating anovular menstruation with combined gonadotropins. Their reference to the work of some of the original proponents of this therapy, however, does not include more recent reports by the same authors in which the success from such treatment is seriously questioned. The problem of sterility is handled in two chapters. Empiric use of luteal phase progesterone, a therapy and gonadotropin therapy are discussed in 5 out of 38 chapters.

The problem of sterility is handled in the last nine chapters. Empiric use of low dosage irradiation of pituitary and gonads was followed by pregnancy in 65 out of 78 barren women with amenorrhoea or oligomenorrhoea. Certainly success such as this, reported by the authors in an analysis of 695 cases of sterility deserves the attention of other workers in this field.

DIAGNOSIS AND TREATMENT OF MENSTRUAL DISTURBANCES AND STERILITY By Charles Maser M.D. and Robert M. Maser M.D. New York: London: 1963. Pp. 200. 10s. 6d.

The family physician may find that the wealth of detail presented in this volume is somewhat confusing in the clinical management of his cases and he may regret the lack of a more critical assessment by the authors of much of the work by others quoted in this book. Of more particular interest to the specialist whose experiences may justify his being quoted as accepting all of the therapeutic procedures mentioned.

principles and pro-
SOMERS H. STURGIS

THE book *Adolescent Sterility* is an interesting and well written monograph which attempts to answer the question: What, if any interval of time normally elapses between the appearance of the first menstruation, the menarche and the ability to conceive and carry a fetus to term? The evidence that a period of adolescent sterility exists in most mammals and that the onset of fertility is not synchronous with reproductive maturity has been presented in a very readable manner. This text will be of most interest to investigators of problems of human fertility anthropologists, and endocrinologists.

SOMEKHA H. STUBBS.

JOHN W. JOHNS.

JOHN W. HUTMAN

THE highly specialised book, *A Manual of Tomography* by Weinbren¹ will serve well as a reference for those interested in body section radiography. Even those radiologists who have had considerable experience in the method will find it useful. The present and the technical aspect of the method are presented briefly in Chapters I and VII. The section on theory is inadequate without supplementary reading from the references in order to obtain a full understanding of the method but the section on technique will serve well as a guide for the technician.

The chapters on the clinical applications of the method present rather fuller details of the conditions in which the method is used.

The chapters on the clinical application of the method present rather fully the findings in most of the conditions in which tomography is a useful aid in diagnosis. The superiority of the method in the demonstration or appraisal of many lesions is well illustrated by the comparison of many lesions in the centogram with the conventional body section of the same region. The text is elaborately illustrated with x-ray films on lithographic illustrations.

The text is elaborately illustrated with 391 reproductions of x-ray films on its 567 pages. These recent photographic illustrations unfortunately have been printed in the positive (black and white reversed from the original) and for this reason frequently fail to bring out details which are discussed in the text and which were evidently present in the author's original roentgenographic film. A bibliography of some 69 references is included and the index is adequate.

The book has been well printed on good quality paper but the binding is poor.

The book has been well printed on a good quality paper but the binding is still of war time quality

ADOLESCENT STERILITY By M F Ashley Montagu. Springfield, Illinois. Charles C. Thomas Publishers. 46s.

A MANUAL OF TOPOGRAPHY By H. H. Henshaw, F. G. S. (A.I.)
R. C. S. (Eng.) J. R. C. P. (Lond.) F. R. S. (Lond.) D. C. R. E.
(Cant.) London H. K. Lewis & Co. Ltd. 1940

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"ADOLESCENT STERILITY" By M F Ashley M.D. 1946. 946.
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 (Camb.) London H & Lewis & Co. Ltd., 1946

an analysis of 695 cases of sterility in men, workers such as this, reported by the attention of other workers in this field.

DIAGNOSIS AND TREATMENT OF MENSTRUAL DISORDERS AND STERILITY By Charles Mager, M.D. and S. Leon Israel, M.D. and ed. by New York London Paul H Hoeber Inc. 1940.

reactions. However glass tubing and stainless steel tubing left in the abdomen for 2 weeks produced no adhesions. Large open glass tubes (lamp chimney drains) anchored with stainless steel wire sutures over intestinal suture lines as a protection against leakage or necrosis of the bowel showed no adhesions at the end of 4 days.

The author discusses the methods and advantages of stage drainage of the abdomen using fine stainless steel wire sutures and a large caliber glass or other tube. However he believes that the most effective method of abdominal drainage, when there is intraperitoneal exudation leakage, or contamination is by means of a sump drain. The drain consists of a perforated tube made of glass or stainless steel in which is placed a second aspirating tube which is connected by rubber tubing with a water spigot aspirator or an electric pump.

Sump drainage of the abdomen is used with great success by the author in cases of intraperitoneal leakage from a perforated appendix with diffuse purulent peritonitis in most types of biliary surgery in large bowel resections for carcinomas, and in cases of ulcerative colitis requiring major surgery.

The use of drains for preoperative and postoperative diagnosis for the arrest of initial and recurrent hemorrhage and for the early detection of ileus and other conditions is described. The use of jejunostomy in gastric surgery is discussed and various tubular enterostomy procedures are suggested as a substitute for a formal preoperative colostomy as a decompressive measure. Abdominal aspiration drainage by means of a sump drain as shown by the author is a surgical step forward and should find an ever widening field of usefulness. EDWARD F. LEWISON, M.D.

Sanders, G. B., and Hodge, L. G.: Surgical Management of Gunshot Wounds of the Pelvic Viscera and Their Late Complications. *Ann. Surg.* 1947 125 399.

Because of the close association of viscera and organs of several systems within the pelvis gunshot injuries of this region are among the most severe of war injuries. The pelvic fracture itself is relatively insignificant compared to the lethal potency of injury to its contents.

The primary surgical management of these injuries guided by the principles of prompt recognition, early repair, efficient diversion of urinary and fecal currents, when necessary and adequate drainage at all times, is of paramount importance not only for the saving of life, but for the prevention of distressing complications later.

Deviation from fundamental surgical principles in early surgical care of gunshot injuries to the pelvis and its viscera results in increased mortality and morbidity and in the necessity for further elaborate surgery involving the sacrifice of tissues and organs, with added risk to the patient.

Surgeons charged with the primary care of these injuries should be alert to the possibilities of concealed extraperitoneal damage to the bladder, rectosigmoid, and ureters. Injuries to the ureters are most often unrecognized at the time of primary operation when an unparalleled opportunity exists for the preservation of the associated kidney.

Proximal colostomies should divert and defunction, as well as decompress. Cecostomy is not an efficient diverting or defunctioning procedure.

The proper location of a proximal colostomy should take into consideration the likelihood of further reconstructive surgery upon the distal bowel. In wounds of the pelvic colon, especially. It may be wiser to place the colostomy no lower than the transverse colon and to perform a complementary transverse colostomy along with exteriorization of a damaged pelvic colon.

Persistent fecal and urinary fecal fistulas, particularly those traversing bone, require a direct attack for permanent closure, which is most satisfactorily done transperitoneally upon a bowel defunctioned by an efficient proximal colostomy. Following efficient fecal diversion, spontaneous closure of urinary fecal communications often occurs, provided urinary decompression or drainage is maintained and infection of the urinary tract is kept at a minimum. Reopening of such an apparently closed urinary fecal communication commonly follows restoration of the fecal current, indicating that direct attack on the fistula is necessary for permanent cure in most cases.

The histories of 5 illustrative cases are presented
JOSEPH GASTER, M.D.

Morhardt, P. L.: A New Syndrome; Congenital Cystic Pancreatitis and the Rh Factor (Un nouveau syndrome: la pancréatite kystique congénitale et le facteur rhésus). *Presse méd.*, 1947 55 243

The author reviews the syndrome of congenital cystic pancreatitis and notes the case of an infant with this disease who had a brother born subequently with erythroblastosis and lterus.

It is possible that a precipitin elaborated by the mother in the amniotic fluid is swallowed by the fetus and reacts with the fixed antigens of the bronchial glands, the pancreas, and the bowel, to which the amniotic fluid has free access during fetal life.

In the opinion of the author this problem is of exceptional therapeutic interest and merits further investigation.

EDWARD W. Oakes, M.D.

MISCELLANEOUS

Farris, Edward M. and Douglas, Russell V.: Abdominal Actinomycosis. *Arch. Surg.* 1947 54 434.

A brief résumé of the clinical manifestations and therapy of abdominal actinomycosis is presented.

Five cases of abdominal actinomycosis treated at the Grady Hospital Atlanta, Georgia, are reported. Apparent cures have resulted in all 5 cases.

The authors have used penicillin in all their cases in conjunction with sulfadiazine therapy. The value of chemotherapy in the treatment of abdominal actinomycosis is supported by the fact that after its prolonged use the numerous microscopic sections and repeated cultures of the surgically excised tissue showed no evidence of actinomycotic infection in 4 of the 5 cases reported here.

However surgical treatment is of the utmost importance in the treatment of abdominal actinomycosis. Surgical drainage of all abscesses and excision of diseased tissue, insofar as can be achieved are essential in the treatment of this disease.

CHARLES BAROZ, M.D.

Sweetser, T. H.: Surgery of Retroperitoneal Tumors. *J. Urol.*, Balt., 1947 57 65

Three factors are especially important in the surgical approach to any malignant tumor (1) it must allow exposure and division of the veins and lymphatics before any tumor cells can be squeezed into them by operative manipulation (2) it must give the best possible exposure to reduce the risk by allowing better hemostasis and more accurate dissection and (3) it must do the least possible damage to the surrounding structures. The latter is less important than the first two.

Most renal and other retroperitoneal tumors have been approached by either the lumbar extraperitoneal route, or by a transperitoneal route. The lumbar incisions described heretofore are unsound for removal of malignant tumors because they require manipulation of the tumor before the blood vessels and lymphatics are divided; moreover these incisions give poor exposure unless important nerve

trunks are divided. The transperitoneal incisions allow division of the renal pedicle before manipulation of the tumor but are definitely more dangerous due to peritoneal exposure.

The author advocates an incision which has the advantages and relative safety of the lumbar route, and gives even better exposure than does the transperitoneal approach. The patient is placed on his side with the kidney rest up and the usual oblique lumbar incision between the eleventh and twelfth dorsal nerve trunks is made. If the diagnosis of malignancy is confirmed the incision is extended anteriorly across the rectus muscle to a point about halfway between the navel and the symphysis pubis, and is thence extended upward as a paramedian incision to the xiphoid. All layers of muscle and fascia down to the peritoneum are included. The large triangular flap is lifted laterally and upward over the retracted rib margin. With the use of the extra peritoneal layer of fat as a line of cleavage, the peritoneum is pushed aside unopened. After removal of the tumor the wound is closed with interrupted sutures of No. 1 chromicized catgut, including all muscle and fascial layers en masse, placed before and tied after lowering the kidney rest and straightening the table. A continuous suture is placed in the external oblique fascia, and the skin is closed with clips. A Penrose drain is extended from the renal space posteriorly.

The author states that these wounds heal solidly; per primam most of his patients were out of the hospital on the thirteenth day. He states that surgery for any mass in the kidney should be undertaken with the possibility of malignancy in mind, and with adequate preparation and draping of the field. The incision described preserves the nerve supply to all the abdominal muscles, and the exposure is better than with any other kind of incision.

JOSEPH E. MAURER, M.D.

Babcock, W. Wayne: Newer Methods of Abdominal Drainage. *Arch. Surg.* 1947 54: 365

The author briefly mentions the historical aspects of abdominal drainage. At one time surgeons, fearing to leave ligatures within the abdominal cavity left the ends hanging from the wounds.

Investigations which began with local tissue reaction to wired sutures and ligatures, inevitably led to studies of the reaction of foreign bodies to drains. The author and his surgical residents found that catgut sutures exposed on the peritoneal surface were soon covered by dense adhesions. Silk and cotton sutures formed adhesions but to a lesser degree while stainless steel wire sutures formed no adhesions.

In applying these observations to abdominal drains, it was evident that in some cases it was desirable to produce early adhesions to localize the drained area, while in other cases adhesions prevented the drainage of outlying septic areas, and were harmful. Gauze drains were surrounded by adhesions in from one-half hour to 2 hours. Rubber tubes and plastic drains produced similar fibroplastic

carried out in the aged. The established mortality rates for these age groups in relation to life expectancy are discussed.

The case records of 313 women 60 to 87 years of age were studied. These patients were on the gynecologic services of Cook County (196) Michael Reese (76), and Mt. Sinai Hospitals (41) in Chicago.

The mortality rate in old people treated surgically is higher than that in young people. Since the risk is greater in old people each patient must be studied individually. The details of proper preoperative precautions, the selection of anesthesia (especially local), meticulous operative procedures, and of proper post-operative care are presented. The author concludes that gynecologic surgery may be performed in old women (past 60 years) under urgent imperative or elective conditions if these precautions are observed.

The higher mortality rate in older people (4.5 per cent in the series studied and all occurring at Cook County Hospital) was due to sepsis, shock, embolism, pneumonic infections, uremia, cardiac failure but also to the higher incidence of malignancies. With chemotherapy and blood transfusions the most common operative complication may be combated. Hypertension without marked cardiac damage is no great hazard. It may be improved by overcoming the partial ureteral obstruction and its resultant effect on the kidneys in the correction of pelvic hernia with the prolapsing uterus.

The author observes that the relief experienced by an old woman with proctocentesis with good life expectancy more than balances the risk involved in the surgical care.

JAMES R. WOLFE, M.D.

Judd, G. E.: Preservation of the Upper Pelvic Floor and Bladder Support in Total Hysterectomy. *West. J. Surg.* 1947 55 209.

In the author's method of hysterectomy the abdomen is entered by a lower midline incision. The uterus is separated from the round and broad ligaments or if the adnexa are to be removed from the infundibulopelvic ligaments. The bladder flap of the peritoneum is dissected from the anterior surface of the uterus and the cervix. The uterine arteries are ligated immediately outside of the lateral aspect of the uterus, preferably at a point above the origin of the main cervical branch of the artery.

The uteropubic fascia which can be clearly identified is dissected from the anterior surface of the cervix. Both sharp and blunt dissections are required which should be continued downward to the anterior fornix of the vagina. By the described procedure the bladder and the ureters become easily movable thus the danger of injury to these organs is greatly diminished. At the same time, as Richardson pointed out, a less vascular area will be encountered.

Subsequently, the cardinal ligaments are clamped by placing Kocher forceps inside of the uteropubic fascia, closely parallel to the cervix. By adjusting the clamps within the cuff of the uteropubic fascia injury to the ureter can be prevented as interference with this structure becomes virtually impossible.

The cardinal ligaments are severed from the cervix, down to the lateral fornices of the vagina. Upon separation of the cardinal ligaments from the cervix it is advisable to preserve a small amount of cervical tissue to be used for suturing later on. The uterosacral ligaments are clamped and cut, and the intervening peritoneum is incised. The posterior part of the vagina becomes accessible and is entered through Douglas pouch. The cervix is severed from the vagina under direct vision with either knife or scissors. The cardinal ligaments are sutured to the lateral aspect of the vagina by figure 8 sutures. By placing the suture in the base of the cardinal ligament, lateral retraction can be prevented. In this manner the top of the vagina is incorporated into the supporting structures which previously served to sustain the cervix as well as the vagina. The top of the vagina is closed with interrupted or continuous sutures. In order to re-establish an adequate support for the vagina the cardinal ligaments are approximated in the midline and sutured to the top of the closed vagina. Thus after the cervix, which is the focal point of the endopelvic fascia, has been removed the structures which had previously supported the cervix as well as the top of the vagina are again brought into contact and united. The sutures used in ligating the cardinal ligaments are then tied together for what little additional support they can give in uniting the cardinal ligaments.

The uteropubic fascia together with the mobilized bladder which in the beginning of the operation had been dissected from the cervix, is now carried over the united cardinal ligaments and sutured to the uterosacral ligaments and to the posterior portion of the united cardinal ligaments as well as to the rectovaginal septum or the postcervical endopelvic fascia. Thus the main ligamentous structures of the upper pelvic floor which preoperatively were connected through the cervix laterally as well as anteroposteriorly are now brought into immediate contact.

Finally the entire operative area is covered with peritoneum by using the bladder flap.

DANIEL G. MORTON, M.D.

Reis, R. A., and DeGusta, E. J.: Stress Incontinence in the Female. *Am. J. Obst.* 1947 53 776.

The authors' study is a consideration of the various factors concerned with the involuntary escape of urine through the intact urethra. Incontinence associated with obvious etiologic factors such as fistulas, nerve lesions, and congenital anomalies are not considered.

Complete incontinence is rarely encountered but partial incontinence brought on by sneezing, coughing, or straining is all too common. It is to this type of incontinence that the word stress is applied.

The authors describe the anatomy of the female bladder, urethra, and associated structures and discuss the physiology of micturition. The etiology of incontinence is presented, the authors finding obstetric injury to the urethra and supporting structures the commonest cause of stress incontinence.

GYNECOLOGY

ADNEXAL AND PERIUTERINE CONDITIONS

Campbell, J. V., and Singman, D.: Primary Ovarian Malignancy. *Wed. J Surg* 1947 55 263

Sixty-eight cases of primary ovarian cancer showing definite histological evidence of malignancy are analyzed. Fifty three of the tumors were cystic carcinomas, chiefly cystadenocarcinoma, 12 were solid carcinomas, and 3 were malignant functional tumors. In this series the 5 year salvage was 8 per cent for cystic tumors, 30 per cent for solid tumors, and 100 per cent for functional tumors. The prognosis was worse if metastases, ascites, or bilateral tumors were present. The histological grading of these tumors was believed to be an aid in prognosis.

GEORGE BLINCK, M.D.

MISCELLANEOUS

Holmstrom, E. G., and McLennan, C. E.: Menorrhagia Associated with Irregular Shedding of the Endometrium. *Am. J Obs* 1947 53 727

The authors employ the phrase "irregular shedding of the endometrium" to indicate a specific type of functional uterine bleeding, a clinical and pathologic syndrome characterized by a typical pathologic picture the outstanding feature of which is prolongation of shedding of the endometrium which has undergone progesterone stimulation. In addition, there is often an increase in the amount of bleeding. The diagnosis is suggested by the typical clinical history of regularly recurring menorrhagia, and may be substantiated by recovering the secretory endometrium by curettage during the course of prolonged bleeding, but well beyond the time when endometrial regeneration normally would have occurred.

The shedding of secretory tissue ordinarily is completed within from 48 to 72 hours after the onset of bleeding. Regeneration of a new surface occurs rapidly thereafter and by the fourth or fifth day of the cycle one almost routinely observes new proliferative endometrium. One should not expect to find on the fifth day of menstruation comparatively large areas of secretory glands belonging to the previous cycle. This finding, coupled with a characteristic clinical history of menorrhagia, has been the authors' criterion for the diagnosis of irregular shedding of endometrium.

During a period of 3 years, uterine curettage was done on 243 patients in the Salt Lake County General Hospital, Salt Lake City, Utah. A pathologic diagnosis of irregular shedding of the endometrium was made in 22 of these. To demonstrate the nature of the problem, 3 cases are reported in detail and microscopic sections from 3 additional cases are shown. Typical microscopic findings are described in detail.

With regard to the etiology a number of lesions in the uterus and endometrium may be concerned. The

presence of submucous myomas or endometrial polyps may interfere with the normal shedding process postabortal subinvolution of the endometrium may be associated the simultaneous occurrence of adenomyosis and irregular shedding may be indicative of a common etiology. The authors find that there still remain a large number of cases in which the etiology is obscure, and their study is concerned particularly with this group of cases.

An attempt has been made to show a hormonal basis for the condition. The authors report the results of their experiments in 4 cases in which prolonged progesterone administration was carried out. Although the results have not been constant enough to draw any conclusions, the investigation is being continued. It has been found that the microscopic picture characteristic of the disease can be produced in the endometrium of the normal female by the injection of progesterone during the bleeding phase of the cycle.

JOHN R. WOLFF, M.D.

Campbell, R. E.: The Treatment of Pelvic Tuberculosis in the Female by Radiation Therapy Based upon Experimental Evidence in the Animal and Clinical Results in the Human Being. *Am. J Obs*, 1947 53:495

The treatment of pelvic tuberculosis in women has been subjected to considerable controversy. The author considers the radiologic aspects of therapy in this disease relative to experiments in the animal and clinical investigations in the human being.

It was decided to produce pelvic tuberculosis experimentally in the female dog and subject the animal to roentgen ray therapy in order to observe the effect. A strain of attenuated bovine tubercle bacilli which tended to produce localized nonprogressive lesions, was selected as being suitable for this research. Twenty dogs in which the tuberculous process was limited to the pelvis were used and 9 of the dogs were studied over a 1 year period.

Analysis of the results showed that roentgen ray therapy was beneficial in pelvic tuberculosis, as there was a tendency to limit the disease to the pelvis, a direct effect upon the absorption of the exudate, and reduction of the secondary inflammation. These results led the author and his associates to believe that, contrary to the previous condemnation of the use of x-ray in the treatment of pelvic tuberculosis in the female, its use should be reconsidered. Selected case reports are presented.

JOHN R. WOLFF, M.D.

Lash, A. F.: Surgical Geriatric Gynecology. *Am. J Obs*, 1947 53 766.

The author reviews the results of previous studies of gynecologic surgery in the aged, analyzes a statistical study of a fairly large series of patients, and attempts to further evaluate the advantages, and the conditions under which gynecologic surgery may be

PREGNANCY AND ITS COMPLICATIONS

The present series of 436 cases of ectopic pregnancy was gathered from the Clinica Ostetrica e Ginecologica of the University of Rome over a period of 8 years. All of the cases were carefully studied as to their past and family history, symptomatology, pathology and clinical course. Although age, social condition, the time elapsing since the beginning of sexual life, and parity of the husband and wife appeared to be predisposing factors to the ectopic condition a constitutional factor and the inflammatory changes were found to be the former was commonly

Clinical eclampsia is always preceded by the pre-eclamptic state of which albuminuria is the earliest symptom. A survey of all the concepts and observations leads to the conclusion that eclampsia is a renal syndrome, which may be referred to as uteroplacental apoplexy. The authors seek to determine whether the various symptoms of eclampsia can be dissociated from one another or whether they are simply all manifestations of a single etiology.

of the nervous system, particularly the sympathetic system, in renal pathology has long been proved clinically and by animal experiments. Even in functional conditions the role of the sympathetic system is significant. The character of the disease, its evolution, and its habitual reversal all plead in favor of an initial functional glomerular disease identical with that of experimental glomerular disease. In the latter cases there is no pre-existing disease. This concept of gravid albuminuria substantiates the notion of a functional renal trouble of unknown origin for the notion of a renal parenchymal disease. It is by the sympathetic route that the excitation attains its receptive organ. Cannot one admit that gravid albuminuria is a functional derangement of the sympathetic nervous system?

ne various symptoms of eclampsia are examined in the light of this concept. The oliguria observed is of short duration and appears to be due more to a reflex mechanism than the anuria observed in cases of acute or infectious nephritis. As to edema (absent by definition in monosymptomatic albuminuria) it exists independently of all renal manifestations and appears suddenly; its location in the body is often unusual and is not in keeping with the concept of chloride retention secondary to impaired renal permeability—which points to a functional overactivity of the posterior lobe of the pituitary gland. The role of the nervous system in hypertension has been proved by the Goldblatt experiments. Azotemia has been observed in animals on prolonged sympathetic excitation and clinically in cases of cerebral hemorrhage; both observations attesting to a functional

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Operations devised to correct stress incontinence are evaluated. All these procedures have in common the tightening of the fascial planes which surround the urethra, together with reduction of the urethral lumen.

The paraurethral operation described by Berkow is presented in detail. The procedure involves an encircling incision around the external urinary meatus with subsequent paraurethral dissection toward the bladder until the urethra has been freed sufficiently to allow the dissected urinary meatus to lie just under the clitoris without tension. The urethra is now anchored just below the clitoris by three interrupted mattress sutures, using chromic catgut No. 00. This upward placement of the urethra brings into play the pubococcygeus muscles which are now

united in the midline beneath the urethra by two to four interrupted sutures. The bulbocavernosus muscles are then united in the midline, thus completing the second layer of sutured muscles which hold the urethra upward.

The authors present a series of 33 patients suffering from stress incontinence, in whom the procedure was carried out. It was completely successful in 31 patients, the 2 failures occurring in women in whom the etiology of the stress incontinence was not obstetric. Patients were followed for periods ranging from 5 to 54 months postoperatively.

In conclusion the authors state that paraurethral fixation is a most satisfactory operation for the relief of stress incontinence following obstetric injury.

JOSE R. WOURT, M.D.

OBSTETRICS

PREGNANCY AND ITS COMPLICATIONS

Fumarola, A.: Survey of 436 Cases of Ectopic Pregnancy (Considerazioni clinico-statistiche sopra 436 casi di gravidanza ectopica) *Ginecologia*, Tor 1947 13 49.

The present series of 436 cases of ectopic pregnancy was gathered from the Clinica Ostetrica e Ginecologica of the University of Rome over a period of 8 years. All of the cases were carefully studied as to their past and family history, symptomatology, pathology and clinical course. Although age, social condition, the time elapsing since the beginning of sexual life, and parity of the husband and wife appeared to be predisposing factors to the ectopic condition, a constitutional factor and the presence of inflammatory changes were found to be the principal causes. The former was commonly manifested by irregularity of the menarche or subsequent menses, or a defective previous pregnancy. To these two causes were added minor ones, such as previous gynecological intervention, the presence of structural changes (cysts or fibromas), acute or chronic enteritis, appendicitis, or peritonitis.

Review of these 436 cases indicated that prophylaxis of the causes presented could well be instituted.

EDITH B. FARNSWORTH M.D.

Rivière, M., Saric, R., and Navarrette, P.: Albuminurias of Gestation. New Physiopathological and Pathogenic Concepts (Les albuminuries de la gestation nouvelles conceptions physiopathologiques et pathogéniques) *Gyn. obs.* Par 1946 45 458.

Under the term albuminurias of pregnancy are included those which occur essentially because of the state of pregnancy and not from any coexistent condition such as nephritis. What the authors refer to as monosymptomatic albuminuria lasts throughout pregnancy, regresses thereafter and is often associated with symptoms of pre-eclamptic toxemia. The association of eclampsia and uteroplacental apoplexy and albuminuria is analyzed.

Monosymptomatic albuminuria occurs in from 30 to 80 per cent of all pregnancies according to various authorities. It appears most often in primiparas. It is detected most often in the last trimester of gestation. The amount of albumin in the urine varies from a trace to several grams. There is no oliguria with this type of albuminuria, the physical properties of the urine are not modified, and sediment is minimal. Infectious causes for the albuminuria have been ruled out. There may be no clinical manifestations coexistent with the albuminuria. The evolution of this type of albuminuria is variable, even without treatment it tends to stabilize itself without accident to mother or fetus. Generally it tends to increase gradually during pregnancy and disappear after parturition; it appears in subsequent pregnancies.

In the study of pre-eclamptic toxemia, albuminuria generally represents the initial symptom followed by hypertension, edema, oliguria, gastric upsets, headache, and visual disturbances. While under treatment, the subjective symptoms of pre-eclampsia disappear, albuminuria persists. Death of the fetus modifies the pre-eclamptic state in many ways but it does not modify the albuminuria.

Clinical eclampsia is always preceded by the pre-eclamptic state of which albuminuria is the earliest symptom. A survey of all the concepts and observations leads to the conclusion that eclampsia is a renal syndrome which may be referred to as uteroplacental apoplexy. The authors seek to determine whether the various symptoms of eclampsia can be dissociated from one another or whether they are simply all manifestations of a single etiology.

Does monosymptomatic albuminuria represent a pathological or clinical entity? It does not attest to kidney disease any more than does orthostatic albuminuria. It appears to be solely a functional trouble. The rarity of cylindruria, persistence of normal diuresis, normal renal permeability and reversibility of signs after gestation argue for a purely functional derangement.

The role of the nervous system, particularly the sympathetic system in renal pathology has long been known, proved clinically and by animal experimentation. Even in functional conditions the role of the nervous system is significant. The character of the albuminuria, its evolution, and its habitual reversibility all plead in favor of an initial functional glomerular cause identical with that of experimental albuminuria. In the latter cases there is no pre-existing nephritis. This concept of gravid albuminuria substitutes the notion of a functional renal trouble of nervous origin for the notion of a renal parenchymal cause. It is by the sympathetic route that the excitation attains its receptive organ. Cannot one admit then that gravid albuminuria is a functional derangement of the sympathetic nervous system?

The various symptoms of eclampsia are examined in the light of this concept. The oliguria observed is of short duration and appears to be due more to a reflex mechanism than the anuria observed in cases of toxic or infectious nephritis. As to edema (absent by definition in monosymptomatic albuminuria) it exists independently of all renal manifestations and appears suddenly; its location in the body is often unusual and is not in keeping with the concept of chloride retention secondary to impaired renal permeability—which points to a functional overactivity of the posterior lobe of the pituitary gland. The role of the nervous system in hypertension has been proved by the Goldblatt experiments. Azotemia has been observed in animals on prolonged sympathetic excitation and clinically in cases of cerebral hemorrhage, both observations attesting to a functional

Operations devised to correct stress incontinence are evaluated. All these procedures have in common the tightening of the fascial planes which surround the urethra, together with reduction of the urethral lumen.

The paraurethral operation described by Berkow is presented in detail. The procedure involves an encircling incision around the external urinary meatus with subsequent paraurethral dissection toward the bladder until the urethra has been freed sufficiently to allow the dissected urinary meatus to lie just under the clitoris without tension. The urethra is now anchored just below the clitoris by three interrupted mattress sutures, using chromic catgut No 00. This upward placement of the urethra brings into view the pubococcygeus muscles which are now

united in the midline beneath the urethra by two to four interrupted sutures. The bulbocavernosus muscles are then united in the midline, thus completing the second layer of sutured muscles which hold the urethra upward.

The authors present a series of 33 patients suffering from stress incontinence, in whom the procedure was carried out. It was completely successful in 31 patients, the 2 failures occurring in women in whom the etiology of the stress incontinence was not obstetric. Patients were followed for periods ranging from 5 to 54 months postoperatively.

In conclusion the authors state that paraurethral fixation is a most satisfactory operation for the relief of stress incontinence following obstetric injury.

JOSEF R. W. LEE, M.D.

origin. Retinopathy and neuropathy are two peripheral manifestations of angospasm a functional state. Convulsive seizures which may or may not be preceded by albuminuria and hypertension originate from a diencephalic center. In fact all of the symptoms of eclampsia seem to have their origin in the region of the hypothalamus.

The albuminuria of gestation and all its related symptoms seen in eclampsia can be ascribed to a functional derangement of the diencephalic and pituitary sympathetic centers, which are anatomically and functionally a unit. Gestation seems to set off the hypophyseal infundibular mechanisms which appear in regular chronological order.

Endocrine studies of diabetic pregnant women reveal that in all cases in which toxemia was present there was an abnormal level of estrogens and an elevation of gonadotropin, this elevation preceding by several weeks the appearance of the pathological phenomena.

Gestation is not the only condition which gives rise to modified hormonal levels in the maternal or gametic. There is no hormone specific to pregnancy and many changes that occur in pregnancy have their counterpart in the normal menstrual cycle.

It is not unreasonable to think that the albuminuria of pregnancy is no more than a peripheral manifestation of a general process of which the physiological mechanisms have their origin in the diencephalon and their course through the sympathetic nervous system, under endocrine regulation.

PHILIP B. CRANE, M.D.

Ellis, J. T., Windham, S. W., Jr., McFatter, T. K., and Latholais, S. G. Spontaneous Rupture of the Uterus. *South. Surgeon* 247: 13, 70.

The authors report, in detail, a case of spontaneous rupture of the pregnant uterus. One patient was a primigravida of 4½ months gestation, the other a 37 year old multigravida at term. In the case of the primigravida, the condition is believed to be unusual in that sepsis following rupture of the uterus had resulted in a fistula of the abdominal wall through which a fetal hand was protruding. The multigravida was delivered of a living child by cesarean section though the fetus had been extruded completely into the peritoneum.

In America rupture of the uterus occurs less frequently than in Europe because there is less pelvic distortion due to rickets and osteomalacia and more medical supervision in obstetrics. The incidence of this condition, as reported in large obstetrical centers, ranges from 1 in 95 to 1 in 4,000 deliveries. It occurs only rarely before the onset of labor. Balsch, in 1903, collected 78 such cases from the literature. Since that time the list has grown very gradually but the condition is still rare. The etiological factors include previous cesarean section, especially of the classical type, previous myomectomies improper and energetic curettements and previous pelvic infection. This last factor is considered one of the important predisposing causes to uterine rupture.

Microscopic study of these uteri show increased fibrous tissue in the uterine wall.

Rupture of the uterus before the onset of labor usually occurs in the fundus, whereas ruptures occurring during labor are more often in the lower uterine segment.

Practically all cases of spontaneous rupture of the uterus are in multiparas with an average of 4 to 6 siblings in the various groups reported.

The signs and symptoms in the order of frequency are bleeding, severe pain, abdominal tenderness, cessation of labor, shock, pallor, change in position of the fetus, syncope, blood in the urine and distention. Two of these symptoms are emphasized, cessation of labor and blood in the urine. These symptoms plus abdominal tenderness should always be treated as rupture of the uterus.

The treatment of choice is laparotomy. Only by this means can a normal infant be delivered and the hemorrhage stopped and the uterus repaired or removed. Shock must be treated with sufficient blood or plasma. Infection must be combated by drainage, sulfadiazine and penicillin.

The maternal mortality varies in the series reported from 50 to 100 per cent. The fetal mortality is about 90 per cent. In the authors' cases, both mothers died, however one of the infants lived.

HARRY FREED, M.D.

Russell, P. B., Jr.: Abortions Treated Conservatively: a 12 Year Study Covering 3,739 Cases. *South. M. J.* 1947 40: 3, 4.

The author's cases of abortion are divided into three groups based upon the years in which they occurred. Further classification was based upon the clinical picture and was as follows.

- 1 Spontaneous, with onset from no apparent cause.
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- 3 Complete, with a history of pregnancy and the passage of products of conception. Little or no uterine activity.
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- 5 Febrile with a temperature of 100.4 F or more on 2 or more days after the first 24 hours, and with or without active signs of infection. (These patients should be isolated.) About one-fourth of the total will be in this group.
- 6 Afebrile with no fever or active signs of infection on admission or during the convalescent period. About 75 per cent of the cases were in this group.
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A vaginal examination should be limited to the introduction of the speculum for smears. In general, the treatment is as outlined below.

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THE seventh volume of the *Encyclopedia of Endocrinology* by Hans Selye is a monumental documentation of most of the world's literature on the subject of ovarian tumors presented in outline loose leaf notebook fashion. An additional 427 page volume of bibliography accompanies the text. Many thousands of references have been collected, classified, and reviewed. This volume is part of an encyclopedia of endocrinology which according to the author, is a "first tentative effort to make the entire endocrine literature easily accessible to research

ENCYCLOPEDIA OF ENDOCRINOLOGY. By Hans Selye, M.D. 1942 D.Sc., F.R.S. (Canada). Sect. IV Vol. 7 Ovarian Tumors. Montreal, Richardson, Wood and Wright 948

workers and clinicians. All bibliographical information has been carefully checked for correctness and the investigator seeking a basic bibliography on any phase of ovarian neoplasms will find it of incalculable help. The magnitude of the task has made it obviously impossible for the author to evaluate critically all of the assembled data as a result the reader will at times be somewhat confused by the mass of uncorrelated facts.

This text should unquestionably be available for reference purposes in the library of every teaching institution. It is doubtful if students or clinician will find it a satisfactory substitute for more orthodox textbooks of gynecological pathology.

JOHN W. HUFFMAN

BOOKS RECEIVED

Books received are acknowledged in this department, and such acknowledgment must be regarded as a sufficient return for the courtesy of the sender. Sections will be made for review in the interests of our readers and as space permits.

UTERINE CONTRACTILITY IN PREGNANCY. By Douglas P. Murphy, M.D. F.A.C.S. Philadelphia, London, Montreal J. B. Lippincott Co., 1947

DIAGNOSTIC HORMONAL TREATMENT TERATOMATA IN ANTERIOR. By Claude Blecere Paris Masson & Co., Editores, 1946.

DEUTSCHEN FACHZEITUNG FÜR GYNEKOLOGIE UND FORTBILBUNG DER FACHLEUTE. By Max Walker Paris Masson et Cie, Editores, 1946

THE 1946 YEAR BOOK OF GENERAL SURGERY. Edited by E. A. G. Graham, A.B., M.D. Chicago The Year Book Publishers, Inc., 1947

MINUTES IN THE CHAIRS OF THE REPORT OF THE NEW YORK ACADEMY OF MEDICINE COMMITTEE OF MEDICINE AND THE CHANGING ORDER. New York The Commonwealth Fund, 1947

PHYSICAL MEDICINE IN Gynecological Practice. THE AMERICAN PRACTICE IN SEVERAL. Edited by Arthur L. Watkins, M.D. Philadelphia, London Montreal J. G. Lloyd Co., 1946

DE HORMONOVERGEGING DER FOLLIKEL. By Dr. Jules Samuels, London, Netherlands E. J. Brill, 1947

ESSENTIALS OF ENDOCRINOLOGY. By Arthur Grollman, Ph.D., M.D. F.A.C.S. Philadelphia J. B. Lippincott Co., 1947

A HANDBOOK OF COMMONLY USED DRUGS. By Michel Njor and Clark H. Yeager Springfield, Ill. Charles C. Thomas, 1947

TECHNIQUES AND PROCEDURES IN Gynecology. By John Adriani, M.D. Springfield, Ill. Charles C. Thomas, 1947

PRINCIPLES AND PRACTICE OF OBSTETRICS. By Joseph H. De Lee, M.D. and J. P. Greenhill, M.D. 9th ed. Philadelphia and London. W. B. Saunders Co., 1947

FUNDAMENTALS OF CLINICAL Gynecology. By H. Houston Merrill, M.D., Fred A. Mettler, M.D. (Ph.D.) and Tracy Jackson Putnam, M.D. Philadelphia Toronto The W.B. Saunders Co., 1947

UTEROTERMINAL INFERTILITY A CLINICAL DIAGNOSTIC METHOD OF DETERMINING THE TUBAL FACTOR IN STERILITY INCLUDING THERAPEUTIC ASPECTS AND COMPARATIVE NOTES ON HYSTERALOGRAPHY. By I. C. Rubin, M.D., F.A.C.S. St. Louis C. V. Mosby Co., 1947

DISEASES OF THE NOSE AND THROAT. 3rd ed. By Charles J. Temperley, M.D. F.R.C.S., and Herman J. Burman, M.D. F.A.C.S. Philadelphia, London Montreal J. B. Lippincott Co., 1947

DEUTSCHEN FACHZEITUNG FÜR GYNEKOLOGIE UND FORTBILBUNG DER FACHLEUTE. By Dr. Jules Samuels Amsterdam, Holland Hakkert & Co., N.V., 1946

SYMPOSIUM OF THE 11th SURGERY. By H. E. Mulvey, M.D. F.A.C.S. 2nd ed. 1. Lanes The C. V. Mosby Co., 1947

EXPERIENCES WITH FOLK ACID. Tom D. Green, M.D. Chicago The Year Book Publishers, Inc., 1947

DIAGNOSTIC AND THERAPEUTIC. By Jean Guillaume and Jean Sigwald Paris Presses Universitaires de France, 1947

THE PHARMACOPOEIA OF THE UNITED STATES 11th ed. Prepared by the Committee of Revision and published by the Board of Trustees of the United States Pharmacopoeial Convention Easton, Pa. Mack Publishing Company April 1947

PRINCIPLES OF THERAPY INCLUDING SYMPTOMS, THERAPY AND OTHER THERAPEUTIC THERAPY. By John A. Kolder, M.D., M.D. Dr. P. H. Sc.D. L.L.D., L.L.D., F.A.C.P. 2nd ed. New York, London D. Appleton-Century Company, 1947

THE YEAR BOOK OF OBSTETRICS. By Richard A. Leonardo, M.D. Ch.M. F.R.C.S. New York Proton Press, 1947

EYE SURGERY. By H. B. Stallard, M.B., M.D. (Canada) F.R.C.S. (Eng.) Baltimore The Williams & Wilkins Co., 1946

CLIFF PALATE AND SPEECH. By Muriel F. Morley, M.Sc., F.C.S.T. Edinburgh F. & S. L. Livingstone Ltd., 1945

A SYMPOSIUM OF SURGICAL ANATOMY. By Alexander Lee McGee, M.Ch. (Lond.) F.R.C.S. (Eng.) Baltimore The Williams & Wilkins Co., 1946

THE DEVELOPMENT OF IMBILATION ANALGESIA WITH SPECIAL REFERENCE TO THE YEARS 1846-1900. By Harlan M. Duncan, London, New York, Turin Oxford Livingstone Press, 1947

DR. SAMUEL GUTHRIE DISCOVERIES OF CHLOROFORM. By Jesse Randolph Pruitt & W. Weston N.Y. Brewster Press, 1947

HISTORIA DE LA PRÁCTICA DE CIRUGÍA; ASISTENCIA DE LOS FIEBRES TORACICOTOMIALES. By Hernán D. Aguilar Buenos Aires Librería El Ateneo, 1946

THE 1946 YEAR BOOK OF OBSTETRICS AND Gynecology. Edited by J. P. Greenhill, M.D., F.A.C.S. Chicago The Year Book Publishers, Inc., 1947

cyanide solution is given. The vaginal speculum is introduced under aseptic conditions and material protruding from the vagina is removed but exploration is not done further than the internal cervical os. Five cubic centimeters of extract from the posterior pituitary lobe are given intramuscularly upon admission if the abortion is complete or incomplete. In threatened cases this is omitted.

2. In febrile or suspected criminal cases cervical smears and material for culture of aerobic and anaerobic organisms are taken from the uterine cervical canal. The material should be secured less than $\frac{1}{4}$ inch internally of the external cervical os.

3. Plasma should be given on admission if needed. Daily transfusions may be given to combat infections. The Rh factor of the blood for transfusion should be considered.

4. The entire head of the bed should be elevated about $\frac{1}{2}$ foot for postural drainage and the patient should be turned on her abdomen for an hour twice daily.

5. In any case with abnormal bleeding (complete or incomplete abortion) from 0.5 to 1 c.c. of pitocin ergotrate or obstetrical pituitary extract solution should be given every four hours in the deltoid muscle for 3 doses and followed by a 1/320 gr. tablet of ergotrate per mouth every 4 hours for 6 doses. The same treatment should be given for endometritis.

6. Persistent hemorrhage may necessitate the use of a sponge stick or a curette or for packing only.

The author concludes that on the basis of his results the approach to the management of various types of abortion should be conservative. He points out that conservative treatment was unsuccessful in only 35 of the 2,406 cases of incomplete abortion.

JAMES F. DOWNELLY, M.D.

LABOR AND ITS COMPLICATIONS

Trolle, D.: Induction of Labor by Means of Partergin. *An Ergot Alkaloid*. *Acta obst. gyn. scand.* 1947 37 94.

Partergin, a new ergot alkaloid is a watery solution of methyl-ergobasine-tartrate (1 c.c. of solution is equivalent to 0.075 mgm. of methergine). Previous reports have stated it to be free of the complications occurring after the administration of pure ergobasine.

To evaluate objectively the effect of partergin, labor was induced in 48 normal patients by 67 attempts at induction with this drug. The results have been compared with those obtained from 138 attempts at induction on 62 normal patients with pituitary preparation 1 c.c. of which equals 10 Vogelin units. Fifty patients with normal spontaneous labors were used as controls.

When the fetus weighed 3,300 gm. or more, partergin was superior to pituitary for the induction of labor. If the fetal weight was less than 3,300 gm. the difference was not significant. The percentage of successful inductions with partergin was higher when the birth weight was 3,300 gm. or more (79.7%) than

when it was less than this weight (43.0%). No significant difference was demonstrated in the induction of labor between primiparas and multiparas. The medical induction of labor did not seem to increase the frequency of premature rupture of the membranes nor influence the duration of the parturition. No increase was noted in postpartum hemorrhage. There were no harmful effects upon the mothers.

Following the administration of partergin, a significant increase in the tension of the uterus was noted 10 times. In 3 of the 48 cases, fetal death occurred.

The authors advise against the use of partergin for the induction of labor if the fetus is alive.

GEORGE BLINCK, M.D.

Vikbladh, I.: Case of Ovarian Cyst Ruptured in Connection with Delivery. *Acta obst. gyn. scand.* 1947 37 11.

The author reports a case of an unrecognized intrauterine rupture of a large ovarian cyst in a primigravida of 19 years, who on the day following rupture was delivered normally of a fully developed living male child. On the fourteenth postpartum day a laparotomy was performed for the presence of an ovarian cyst with ascites. There were found 2 to 3 liters of free clear gelatinous fluid in the peritoneal cavity and a left multilocular pseudomucinous cystoma 28 by 20 by 16 cm. with a perforation in the cyst wall. The cyst was extirpated and the postoperative course was uneventful. References to the rupture of ovarian cysts during pregnancy are briefly reviewed.

GEORGE BLINCK, M.D.

PUERPERIUM AND ITS COMPLICATIONS

Bubis, J. L.: Puerperal Gynecology. *Am. J. Obst.* 1947 53 187.

The author reports a personal experience extending over a period of 30 years in the performance of repair operations for old, new or combined birth injuries immediately after delivery. In addition, he presents statistical reports of puerperal gynecology as practiced in the obstetric department of Mt. Sinai Hospital, Cleveland, Ohio from 1936 to 1946. The author states that time has not changed but rather has strengthened his conviction that puerperal gynecology is feasible, safe, and of immeasurable value to the patient and should be universally adopted as an integral part of natal care.

The importance of repair of cervical lacerations is stressed, and the salient features of the surgical technique are reviewed. Repair of cystocele, rectocele, lacerations of the vaginal walls, and the management of hemorrhoids are discussed.

The experience of the author and his colleagues with thousands of operations performed immediately after delivery in a series of over 200,000 obstetric cases is presented to refute all possible objections to these procedures. Although such operations require special training, skill, and care, they have proved successful in the hands of many different surgeons.

origin. Retinopathy and neuropathy are two peripheral manifestations of angiospasm, a functional state. Convulsive seizures, which may or may not be preceded by albuminuria and hypertension, originate from a diencephalic center. In fact all of the symptoms of eclampsia seem to have their origin in the region of the hypothalamus.

The albuminuria of gestation and all its related symptoms seen in eclampsia can be ascribed to a functional derangement of the diencephalic and pituitary sympathetic centers, which are anatomically and functionally a unit. Gestation seems to set off the hypophysial infundibular mechanisms which appear in regular chronological order.

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Gestation is not the only condition which gives rise to modified hormonal levels in the maternal organism. There is no hormone specific to pregnancy and many changes that occur in pregnancy have their counterpart in the normal menstrual cycle.

It is not unreasonable to think that the albuminuria of pregnancy is no more than a peripheral manifestation of a general process of which the physiological mechanisms have their origin in the diencephalon and their course through the sympathetic nervous system, under endocrine regulation.

PHILIP B. CHASE, M.D.

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The authors report in detail 5 cases of spontaneous rupture of the pregnant uterus. One patient was a primigravida of 4½ months gestation the other a 37 year old multigravida at term. In the case of the primigravida the condition is believed to be unusual in that septa following rupture of the uterus had resulted in a fistula of the abdominal wall through which a fetal hand was protruding. The multigravida was delivered of a living child by cesarean section though the fetus had been extruded completely into the peritoneum.

In America, rupture of the uterus occurs less frequently than in Europe because there is less pelvic distortion due to rickets and osteomalacia, and more medical supervision in obstetrics. The incidence of this condition as reported in large obstetrical centers, ranges from 1 in 95 to 1 in 4,000 deliveries. It occurs only rarely before the onset of labor. Baisch in 1903, collected 78 such cases from the literature. Since that time the list has grown very gradually but the condition is still rare. The etiological factors include previous cesarean section, especially of the classical type, previous myomectomies, improper and energetic curettements, and previous pelvic infection. This last factor is considered one of the important predisposing causes to uterine rupture.

Microscopic study of these uteri show increased fibrous tissue in the uterine wall.

Rupture of the uterus before the onset of labor usually occurs in the fundus, whereas ruptures occurring during labor are more often in the lower uterine segment.

Practically all cases of spontaneous rupture of the uterus are in multiparas with an average of 4 to 6 siblings in the various groups reported.

The signs and symptoms in the order of frequency are bleeding, severe pain, abdominal tenderness, cessation of labor, shock, pallor, change in position of the fetus, syncope, blood in the urine, and distention. Two of these symptoms are emphasized: cessation of labor and blood in the urine. These symptoms plus abdominal tenderness should always be treated as rupture of the uterus.

The treatment of choice is laparotomy. Only by this means can a normal infant be delivered and the hemorrhage stopped and the uterus repaired or removed. Shock must be treated with sufficient blood or plasma. Infection must be combated by drainage, sulfadiazine, and penicillin.

The maternal mortality varies in the series reported from 50 to 100 per cent. The fetal mortality is about 90 per cent. In the authors' cases, both mothers died however one of the infants lived.

HARRY FIELDS, M.D.

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The author's cases of abortion are divided into three groups based upon the years in which they occurred. Further classification was based upon the clinical picture and was as follows:

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A vaginal examination should be limited to the introduction of the speculum for smears. In general, the treatment is as outlined below:

- 1 The vulva should be prepared with sterile soap and shaved. A perineal douche of 1 to 1000 mercuric

larger than 9.3 cm. because, although the head may pass the plane of least pelvic dimensions well flexed the classical mechanism of extension is likely to enlarge the diameter so that 10 cm. should be the figure chosen in determining outlet contraction.

The author also believes that an anteroposterior measurement of 11.5 cm. while not absolutely ruling out contraction of the least pelvic plane does indicate that severe contraction is unlikely.

He cautions that the 9.3 centimeter diameter is an average and represents molding in flexion and that other conditions particularly breech presentation after these diameters markedly. The soft tissue has been deliberately neglected to emphasize bony abnormalities.

Outlet contraction may show itself in various ways chiefly in the second stage of labor but also in the first and third stages. In the first stage uterine inertia may develop with hour glass contraction of the uterus.

Injuries to soft tissue may result from outlet contraction and also from springing of the symphysis pubis.

The treatment consists of antenatal planning in which one must decide to (a) allow labor at term (b) induce labor prematurely and (c) carry out elective cesarean section.

Labor should be carried out with conservatism, with analgesia during the first and second stages of labor. The author seems to favor postural treatment when the head is visible or easily palpable through the perineum, namely the exaggerated lithotomy position. If this fails, he favors the application of forceps especially in primigravida after deep episiotomy. Strict cephalic application should be made and the forceps used mainly for traction, and not rotation.

BYRON F. HESKETT, M.D.

Caso, Rogelio; Uranga Imaz, Francisco, A.; and Rozas, Francisco Fernández: Pelvic Separation (Disyunción pelviana). *Boh. Soc. Obst. Gin. B. Air.* 1946 25 540.

There are four grades of pelvic separation (1) complete separation of the cartilage without serious injury to the ligaments and hence without great separation of the margins (2) injury to the ligament great enough to permit considerable separation of the torn margins and an accompanying sacroiliac lesion (3) rupture complicated with injury to the skin, vagina, or bordering structures and (4) complete rupture of the symphysis pubis. The last is the extreme form.

X-ray has increased recognition of the entity and facilitates the diagnosis.



Fig. 1. (Caso et al.) Maneuvers used for diagnosis.

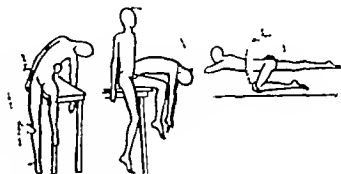


Fig. 2. Additional maneuvers used for diagnosis.

Prolonged labor or operation is the usual cause of the lesion.

Contributory factors are (1) local relaxation of the symphysis or tearing of the cartilage (2) size of the fetus (3) prolonged labor, the mechanism of labor (the passage of the fetal head through the pelvic ring) or intense abdominal contractions (4) application of the forceps, (5) simple dystocia because of stretching of the pelvic ring, (6) trauma (7) age of the patient (8) multiparity and (9) medical mismanagement.

The diagnosis of sacroiliac complication is facilitated by maneuvers shown in Figures 1 and 2. Pain is aggravated by each movement.

Complications include hemorrhage, injury to the urinary mechanism, complete rupture to the extensor associated fracture, and infection.

Treatment consists in prophylaxis if a diastasis exists or is likely to occur and proper measures should be taken even during the course of the labor. Immediate therapy consists of (1) immobilization in bed between sand bags (2) pelvic bandaging and use of the hammock (3) constricting and bandaging and (4) bandaging with continuous weighted extension.

Suturing of the symphysis has been abandoned as definitive treatment. Dubrovsky has advocated a body cast with a turn screw which permits tightening as indicated.

STEPHEN A. ZIEGLER, M.D.

Advantages to the mother include improved general health, saving of time and money, prophylaxis against subsequent disabilities, and probable protection from cancer in later life.

JOHN R. WOLFF M.D.

Hodgkinson, C. P.: Penicillin and Acute Puerperal Mastitis. *Am. J. Obs.*, 1947 53 834.

The author reports his experience in the treatment of 73 cases of infected breasts observed since 1942, all but 7 of which developed in the postpartum period.

In the group with puerperal mastitis, 18 patients, when first seen, were suffering from abscess. Sixteen of the breasts required incision and drainage, while 2 cleared after aspiration. Forty-eight patients were treated with intramuscular penicillin during the cellulitis phase of the disease, with complete resolution in each instance. This response was reflected by the evident decrease in morbidity which averaged 6.1 hospital days. In contrast, the surgically treated group required 42.3 days from onset to complete healing.

Because penicillin is not secreted in the milk in sufficient amounts to control contaminating staphylococci, it is believed advisable to inhibit lactation to prevent reinfection of the breast.

Sulfonamide therapy is not recommended as a substitute for early penicillin therapy. Before penicillin became available 13 patients were treated during the cellulitis phase of the disease with various sulfonamides in apparently adequate dosage; 9 patients required incision and drainage of an abscess, giving a failure of 75 per cent and 4 patients were admitted for penicillin treatment after having failed to respond to sulfadiazine. All promptly resolved when penicillin was given.

JOHN R. WOLFF M.D.

MISCELLANEOUS

Morris, W. I. C.: Outlet Contraction of the Pelvis. *Edinburgh M. J.* 1947 54 90.

The author states that there is no great unanimity with regard to the incidence or even the existence of outlet contraction of the pelvis. The incidence varies, with the author quoted from 6 to 16 per cent and there are those who minimize its importance. In the present article diagnostic criteria which might prove helpful in outlet contraction are examined.

Normally as the fetal head meets outlet resistance it is molded in full flexion so that it approximates a cylinder with biparietal, suboccipitobregmatic, and occipitofrontal diameters, all about equal averaging 9.3 cm. or the largest diameter if the head remains in flexion. During extension, an oblique measurement must pass the outlet roughly this is 10 cm.

The axis of advance of the fetal head through the pelvis makes almost a right angle bend to get to the outlet.

Bony contraction of the outlet may result from (a) absolute narrowing at the plane of least pelvic

dimensions, (b) narrowing below the level of this plane or narrowing of the pubic arch, and (c) combinations of "a" and "b." The first of these may involve either the coronal or sagittal measurements of the outlet. The narrowing may be a general funneling of the entire pelvis, frequently associated with android pelvis, high assimilation pelvis, and some spinal deformities, or an isolated narrowing frequently seen with prominent ischial spines or unusual convergence of the lower sacrum towards the symphysis pubis. Narrowing of the pubic arch is usually independent of any other alteration of the pelvis and results in reduction in available anteroposterior space for the advancing head and may result in interference with internal rotation and increased perineal trauma.

The author mentions the various ways of measuring the pelvic outlet, points out their inadequacies and suggests an engineering principle, namely the use of a gauge in assessing the caliber of an irregular aperture, or a gauge with a diameter of 9.3 cm. In fitting this gauge into the dried pelvis two points are made: (1) the distance between the pubic arch and the cylinder should not exceed 1 cm. and (2) the coronal diameter of the cylinder should be at least 1 cm. in front of the ischial tuberosities.

In measuring the living subject the author describes x-ray pelvimetry and the technique which he employed. In addition, a transparency on which is outlined a circle of 9.3 cm. diameter is superimposed on the x-ray film. The lateral film permits one to make allowances for a narrowed pubic arch angle by correcting the anterior and posterior diameter to what the author calls the "corrected anteroposterior diameter of the outlet."

Cases are illustrated, with diagrams of some of the abnormal findings.

Clinically the following measurements are taken: (a) the anteroposterior of the least pelvic plane (b) the intertuberischial, (c) the posterior sagittal and (d) the anterior sagittal. Attempts are also made to form subjective impressions of (a) the amplitude of the pubic arch and (b) the distance between the ischial spines. The author believes the only measurement that can be taken accurately is the anteroposterior diameter of the least pelvic plane. The other vaginal measurements are described and their inaccuracies discussed.

By taking the anteroposterior diameter of the plane of least pelvic dimensions one can at least pick out the cases for complete x-ray pelvimetry.

He states that with x-ray pelvimetry the diagnosis of a contracted outlet may be made with complete confidence if the anteroposterior or transverse diameter of the plane of least pelvic measurement is less than 9.3 centimeters, admitting that slight narrowing in one direction may be compensated for if the other diameter is larger and assuming that some molding is possible. He suggests that the measurement which he has referred to as the "corrected anteroposterior diameter of the outlet" can be taken as an index of outlet contraction, but states the critical figure is 13

is probably the most important factor in stone formation. The calcium level is influenced by parathormone, vitamin D serum protein and the serum phosphorus, with which last it varies inversely. Hypocalcemia is present in hyperparathyroidism by parathyroidectomy, uremia, and many diseases of bone, the principal endogenous source of calcium 70 to 90 per cent of calcium is excreted in the feces and 10 to 30 per cent in the urine 30 per cent of phosphorus is excreted in the feces and 70 per cent in the urine. Vitamin D and the acid ash diet increase calcium elimination. An excessive chloride acidosis increases the urinary excretion of calcium and is most marked in the case of ammonium chloride. The metabolism of citric acid has a definite relationship to the formation of renal calculi. Citric acid is present in large quantities in bone, where it is interrelated with calcium. The amount of urinary citric acid increases in an alkaline and decreases in an acid urine. The presence of the citrate-ion influences the ionization of calcium, tending to replace the calcium ion participating in the precipitation of calcium phosphate by the readily ionized soluble calcium citrate complex. It has been shown in many cases of recurrent renal calculi without infection that subnormal amounts of citric acid and excessive amounts of calcium are present in the urine. Estrogens increase urinary citric acid without affecting the bydrogenion concentration and they also lower the output of calcium.

The administration of aluminum hydroxide gel forms the highly insoluble aluminum phosphate in the gut and much reduces the absorption of phosphorus. This prevents the precipitation of calcium phosphate in the urine.

Acidifying agents lower the urinary excretion of citrate and increase that of calcium thus keeping the urine saturated and only capable of dissolving the endogenous calcium phosphate without being able to dissolve any existing calcium phosphate deposits in other words to inhibit further stone growth but not to remove stones already present.

The indications for surgical intervention are obstruction of the drainage mechanism of the kidney as evidenced by dilatation shown on intravenous urography especially if there is no likelihood of the stone being passed naturally. Any evidence of failing function in the obstructed part and especially any suggestion of the onset of infection demands active intervention.

Nonoperative treatment is indicated under the following conditions (1) limitation of the calculi to the cortical part of the kidney where they have no macroscopic connection with a calyx (2) mobile stones causing no obstruction, and of such size as to make passage per vias naturales possible (3) stones composed of calcium phosphate or mixed phosphatic stones (4) bilateral stones associated with gross disease and limited function in both kidneys, rendering any operation hazardous.

Much can be done by forced fluids, by correction of faulty diet and by attempts to control superadded

infection. In the case of decubitus calculi or stones consisting wholly or largely of phosphates attempts may be made to dissolve the calculi by the use of Suby's solution G and it is most important to bring this about before secondary infection supervenes particularly with urea splitting organisms, which render the stones relatively insoluble. Sometimes dissolution will proceed satisfactorily and then be arrested owing to the stone having a part composed of some insoluble salt such as oxalate nevertheless, it may have brought about such a reduction in size as to render the natural passage of the stone possible. Another cause of possible difficulty is a slowing down or cessation of dissolution in solution G due to the deposition of a mucoid gelatinous covering on the surface of the stone. If a 0.5 per cent solution of urease be substituted for a few hours this envelope is dissolved and solution G may again prove effective.

For surgical exposure the author favors an incision in the line of the twelfth rib with subperiosteal resection of the rib at the posterior end of the incision. Calculi should be removed by pyelolithotomy if possible. Nephrolithotomy has always seemed to be an undesirable operation to the author because of the nightmare of secondary hemorrhage which may necessitate a secondary nephrectomy especially where the kidney is grossly infected. He also favors a nephrostomy tube in cases in which dilatation has resulted from the presence of a stone. The presence of the tube renders lavage of the pelvis much easier if it becomes necessary.

Calicectomy or partial nephrectomy is a very useful procedure in preventing stone recurrence, particularly when a ragged cavity remains in the lower pole of the kidney after the removal of a stone. Post operative hemorrhage is less likely from the resulting cleanly incised and accurately approximated area of renal tissue than from an incision into a ragged infected cavity surrounding a calculus.

In the presence of bilateral stone, considerable judgment is required in deciding whether to operate at all or which side to approach first. Nephrectomy or even nephroureterectomy may prove the wisest course as the infected calculus kidney seldom if ever returns to complete normality. When however the disease is bilateral conservative surgery even if it leaves a second rate kidney in the end may be the only possibility.

Ureteric calculi. The indications for active surgical intervention in the case of ureteric calculus are the same as in the case of renal calculus, that is, dilatation of the upper urinary tract above the stone particularly if infection is superadded. If neither dilatation nor infection is present a conservative attitude can be adopted indefinitely. The rapid rate at which an obstructed kidney may become totally destroyed once infection gains a foothold must however be kept in mind.

A smooth ureteric stone may retreat into the renal pelvis, thereby relieving obstruction of the kidney. Retreat of a ureteric calculus may sometimes be brought about by preliminary investigations and

GENITOURINARY SURGERY

ADRENAL, KIDNEY AND URETER

MacDonald, S. A., and Matthews, W. H.: Fibrin Foam and Gelfoam in Kidney Wounds. *J. Urol.*, Balt., 1947 57 802.

Two hemostatic agents, (1) fibrin foam, a by-product of fractionation of human blood plasma, and (2) gelfoam, a synthetic made from gelatin solution, were investigated for the purpose of comparing their local effect on tissues following implantation in the kidney.

For this study, large nephrotomy wounds were made in a dog's kidney completely encircling either pole and extending almost to the renal pedicle. In all experiments, gelfoam or fibrin foam was laid in the wound, which was then closed by mattress sutures in the capsule only. The kidneys were removed at six day intervals, the longest observation period being 24 days in the case of fibrin foam, and 36 days with gelfoam. In no instance was there any evidence of postoperative bleeding. The excised kidneys were examined grossly and microscopically with the following findings.

All showed uninterrupted healing with no discernible difference in the rate or character of healing. Microscopically there was no marked inflammatory or foreign-body reaction in the wounds.

The absorption process of the two substances seems to be entirely different. Fibrin foam disappears quite rapidly and undergoes rapid liquefaction. The wound defect fills with granulation tissue, with considerable inflammatory cell exudate, then the usual process of cellular proliferation and fibrosis occurs. The gelfoam wounds show many strands of the substance acting as a scaffolding on which granulation tissue and fibroblastic cells are laid down. Associated with the fibroblasts are many multinucleated giant cells. This gelfoam framework gradually disappears and is replaced by collagen deposits in which the process of healing is completed.

In every instance, fibrin foam was almost completely absorbed in 12 days, and totally absorbed in 18 days. Gelfoam absorbed slowly, requiring 24 days for any noticeable diminution, and some gelfoam was found in the 30 and 36-day specimens. Despite the slow rate of autolysis, the gelfoam substance does not produce any corresponding increase in fibrous or foreign-body reaction.

A detailed report on specimens of each substance is given.

ROBERT O. BEADLES, M.D.

Robinson, R. H. O. B.: Some Problems of Renal Lithiasis. *Proc. R. Soc. M. Lond.*, 1947 40. 201

This very thorough study deals with some particular problems bearing on the etiology, diagnosis, and treatment of stone in the upper urinary tract.

A distinction is drawn between fixed and mobile renal calculus, the latter term referring to a stone

which can migrate within the pelvis and calyces, usually being of such size as to be capable of temporarily obstructing the ureter and thereby predisposing to dilatation and stasis behind it.

Calcification (type 1 and type 11 of Randall) is also mentioned. In the latter an intratubular calcification results from excessive excretion of calcium phosphate, and actual deposition occurs in the walls of the tubules as a result of degenerative changes in them associated with defective blood supply or toxic irritants. In the former an interstitial papillary calcium plaque develops, probably as a result of a response of the kidney to toxins.

Stones develop at a rapid rate in patients who are immobilized in the supine position and are due to stasis alone. The tendency to precipitation is increased when calcium metabolism is upset, partly by disuse atrophy of bone, and by bone disease or bone trauma. These calculi are composed primarily of calcium phosphate, soft and coralline in structure and are situated in the most dependent calyces. They tend to disperse rapidly if the kidney can be flushed by getting the patient out of bed. Frequent x-rays are advisable in recumbent cases. The normally acid urine becomes rapidly alkaline on immobilization. Hence, an acid ash diet and ammonium salts should be given. Mineral oil aperients are undesirable because they lead to deficient absorption of Vitamin A.

The close relationship between infection and stone is also mentioned, attention being drawn to the fact that the organisms in the kidney urine may change from time to time.

Prolonged exposure to heat and sun in hot climates has a definite influence upon the incidence of renal calculus. White races appear to have a higher susceptibility than black.

Calculi associated with hyperparathyroidism are a well recognized group at the present time, but a point which is not so well appreciated is that they can occur without any lesions of the bony skeleton. There is a close relationship between vitamin D deficiency and hyperparathyroidism, vitamin D aiding in the absorption of calcium from the intestinal tract while the parathyroids mobilize it from osseous tissue.

Deficiency of vitamin A disturbs the calcium phosphate ratio and produces changes in the epithelium of the urinary tract.

Oxalate and sulfonamide calculi are obvious instances of crystallization due to the hypersecretory state in which the colloid can no longer hold the excess crystalloid in solution. Oxalates produce secondary deposition on pre-existing calcium plaques especially if hyperoxalemia and hypercalcaemia are present. Oxaluria may be due to a disturbed calcium-phosphorus ratio or to an incomplete oxidation of carbohydrates. Calcium-phosphorus metabolism

is probably the most important factor in stone formation. The calcium level is influenced by parathormone vitamin D serum protein and the serum phosphorus, with which last it varies inversely. Hypocalcaemia is present in hyperparathyroidism, hypervitaminosis D, uremia, and many diseases of bone the principal endogenous source of calcium 70 to 90 per cent of calcium is excreted in the feces and 10 to 30 per cent in the urine 30 per cent of phosphorus is excreted in the feces and 70 per cent in the urine. Vitamin D and the acid ash diet increase calcium elimination. An excessive chloride acidosis increases the urinary excretion of calcium and is most marked in the case of ammonium chloride. The metabolism of citric acid has a definite relationship to the formation of renal calculi. Citric acid is present in large quantities in bone, where it is interrelated with calcium. The amount of urinary citric acid increases in an alkaline, and decreases in an acid urine. The presence of the citrate-ion influences the ionization of calcium, tending to replace the calcium ion participating in the precipitation of calcium phosphate by the readily ionized soluble calcium citrate complex. It has been shown in many cases of recurrent renal calculi without infection that subnormal amounts of citric acid and excessive amounts of calcium are present in the urine. Estrogens increase urinary citric acid without affecting the hydrogen ion concentration and they also lower the output of calcium.

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infection. In the case of decubitus calculi or stones consisting wholly or largely of phosphates attempts may be made to dissolve the calculi by the use of Suby's solution G and it is most important to bring this about before secondary infection supervenes particularly with urea-splitting organisms which render the stones relatively insoluble. Sometimes dissolution will proceed satisfactorily and then be arrested owing to the stone having a part composed of some insoluble salt such as oxalate nevertheless it may have brought about such a reduction in size as to render the natural passage of the stone possible. Another cause of possible difficulty is a slowing down or cessation of dissolution in solution G due to the deposition of a mucoid gelatinous covering on the surface of the stone. If a 0.5 per cent solution of urease be substituted for a few hours this envelope is dissolved and solution G may again prove effective.

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A smooth ureteric stone may retreat into the renal pelvis, thereby relieving obstruction of the kidney. Retreat of a ureteric calculus may sometimes be brought about by preliminary investigations, and

this fact emphasizes the importance of x-ray control immediately before or preferably if necessary during operation.

In the case of the pelvic portion of the ureter spontaneous passage of calculi occurs in a high proportion of cases (90 per cent in the author's) although some time may be taken in the process.

Of the instrumental methods, the author has found the use of an indwelling ureteric catheter (passed alongside the stone and kept *in situ* for 48 hours) the most satisfactory method. If the Howard corkcrew or the Council umbrella extractor is used, it is always wise to insert an indwelling ureteric catheter to counteract the effects of reactionary edema. The author is very apprehensive of their use, despite the results that have been achieved.

Actual meatotomy of the ureteric orifice is seldom necessary and is better avoided because of the risks of troublesome hemorrhage and, more important, ureteric incompetence with vesicorenal reflux.

If instrumentation fails operation is indicated. The author employs both the midline and inguinal approaches. The latter is simpler but if the stone is very low he prefers the former. Under certain conditions a transperitoneal approach may have great advantages, particularly in women.

FERNANDEZ A. LLOREN, M.D.

BLADDER, URETHRA, AND PENIS

Alenka, C.: Roentgenographic Examination of the Bladder; Stereopneumocystography (L'examen radiologique de la vessie (stéréopneumocystographie)). *J. urol. méd. Par.* 1946-1947 53 69.

The author describes a new method to visualize X-ray transparent objects in the bladder such as soft calculi, diverticula, and tumors of the bladder or of the prostate. He uses as contrast medium a mixture of air and an iodine containing compound.

After emptying the bladder completely with a catheter 20 c.c. of the contrast medium Roche and



Fig. 2 (Alenka) Interpretation of the stereoscopic view of Fig.

100 c.c. of air are injected through the same catheter which remains in place and is clamped off.

Simple roentgen pictures so obtained are very hard to interpret. The irregularities of the floor and the walls, and the muscular ridges of the bladder give a whole scale of shades and capacities of different degree which make the picture confusing. To overcome this difficulty, the author devised a method to obtain stereoscopic pictures. The distance of the anticathode to the film is 80 cm. Two films in a case are placed under the patient, the tube is focused from 1 to 2 fingerbreadths above the symphyseal, and 2 pictures are taken at a distance of 4 cm. from each other. From these stereoscopic pictures the author constructed models made of plaster to illustrate the findings. WAXNER M. SOLOFF, M.D.

Ney, C., Auerbach, O., and Hoen, T. L.: Pseudosphincter in Neurogenic Bladder. *J. Urol. Balt.* 1947 57 858.

During the course of studies on the neurogenic bladder the authors observed a definite sphincter like structure lying between the internal and external urethral sphincters. To their knowledge, this finding has not been previously described.

This structure, which the authors have designated a pseudosphincter for reasons which will become apparent, was clearly seen in 8 cases of a total of 21 paraplegics studied. It was situated in the prostatic urethra just distal to the colliculus seminalis in the region of the inferior crista. In half of the cases the pseudosphincter was pale with a sharp edge and although completely surrounding the urethra, its dorsal side more or less tapered into the inferior crista which still could be seen throughout its entirety. In the remaining 4 cases, the pseudosphincter was more fully developed. It was pinkish red with a well rounded corrugated edge, and its dorsal side was raised above the level of the inferior crista which, although obliterated at this level, could still be seen running



Fig. 1 (Alenka) Bladder deformed by the catheter. Diverticula on the right side one of which has a long pedicle. Intravesical projection of a prostatic adenoma which extends to the left lateral wall of the bladder.

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distally from the pseudosphincter. In every instance the pseudosphincter projected into the lumen of the prostatic urethra to an extent that made it impossible to be overlooked.

The prostatic urethra, in the 8 cases, was dilated varying from an early funnel urethra to one with a large sacular dilatation and the pseudosphincter always formed the distal boundary of the dilated portion. At first it was thought that the pseudosphincter might be a relative structure formed as a result of disparity between the size of the lumen of the proximal prostatic urethra and its distal portion. Further study obviated this possibility. In the first place mere dilatation should produce a sphincteric appearance only when looking toward the narrow lumen from the dilated portion not when viewing the structure from the opposite side. In the second place, 8 other cases with dilated posterior urethras showed only a tendency to pseudosphincter formation; the structure was so poorly defined in these cases that the authors considered it unjustifiable to label it a pseudosphincter. In the third place, in the 8 cases in which it was definitely present, the pseudosphincter was conspicuous under all conditions of examination, i.e., whether the water was running or not, and whether the scope was close to the structure or withdrawn for a distance.

Transurethral resection was performed on 3 of the cases merely to obtain suitable specimens of the pseudosphincter and internal sphincter for oncologic study and not as a method of treatment. These two structures were resected separately and individual bites were removed immediately and not permitted to float back into the bladder. These precautions prevented any possible confusion as to origin of the pieces.

The findings in the 3 cases were similar. Microscopic examination of the pseudosphincter revealed transitional epithelium lining the structure. The tissue which was hyalinized and dense connective extensive acute and chronic inflammatory process with edema which threw the overlying epithelium into folds. The inflammatory cells were densely arranged and located chiefly in the subepithelial tissue and they were composed of lymphocytes polymorphonuclear leucocytes mononuclears and histiocytes intermingled in a rich number of distended capillaries. The submucosal glands were lined by plasma. There was a small amount of muscle tissue found with Van Gieson stain. Portions of the prostate lying at the base of the pseudosphincter showed evidence of chronic inflammatory processes in which and mononuclear cells and an increase of interstitial connective tissue. Compared with sections of the internal sphincter taken at the same sitting the latter was also lined by transitional epithelium showing a similar but less extensive inflammatory process. The wall however contained abundant muscle bundles.

JOHN A. LOER, M.D.

Landsteiner, E. K. and Brown H. P.: Observations on the Treatment of Carcinoma of the Prostate by Orchestomy. *Am. J. M. Sc.* 1947 213 450.

The effects of orchectomy in 35 cases of carcinoma of the prostate were studied. The patients were observed for periods varying from 6 months to 4 years. They varied in age from 53 to 87 years. Of the 35 patients 20 had a positive microscopic diagnosis of carcinoma of the prostate while in the remaining 15 the diagnosis was made by physical findings elevated acid phosphatase and roentgen ray evidence of bony metastases.

Of the patients having metastases, approximately two-thirds experienced moderate to severe pain preoperatively. In practically all of the cases, surgical castration was followed by amelioration of symptoms within 48 hours. This rapid response suggests that pain as such is due more likely to pressure on or actual involvement of the nerves by carcinoma (usually in the lymphatics or lymph nodes) rather than by intratranscavit growth which will show no detectable change by the roentgen ray in so short a time. Little improvement can be expected in cases in which the bony metastases destroy the normal contour of the vertebral column. On the other hand where pain is caused by peripheral nerve involvement, one may expect relief in a majority of the cases.

Along with other observers the authors have found that patients who were bedridden and required large doses of opiates were able in several instances to resume their former occupations and no longer required sedation.

As might be expected improvement in well being and appetite paralleled relief of pain in almost all instances. This improvement may be very rapid and dramatic.

In the present series of 35 cases 18 patients had evidence of metastases as seen by the roentgen ray. In the bones there were no constant changes which could be interpreted as signifying regression. Most frequently the osteoplastic metastases became more calcified and appeared more discrete. In a few cases there was no significant change, and two cases only showed decreased density of the osteoplastic lesions with a partial restoration of normal bone architecture.

A very favorable change in the roentgen ray appearance of metastases occurred in one of 3 patients having metastases to the lung fields.

Several patients who showed a progression of metastases by roentgen ray did so in spite of marked clinical improvement.

Although a decrease in size and softening of the original lesion in the prostate was observed in about one third of the patients treated only 5 showed a resulting improvement of urinary function and diminished residual urine. This is not surprising when one considers that in many cases obstruction to urination is contributed to or wholly caused by

this fact emphasizes the importance of x ray control immediately before or preferably if necessary during operation.

In the case of the pelvic portion of the ureter spontaneous passage of calculi occurs in a high proportion of cases (90 per cent in the author's) although some time may be taken in the process.

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FREDERICK A. LYON, M.D.

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Menzies, C.: Roentgenographic Examination of the Bladder; Stereopneumocystography (L'examen radiologique de la vessie (stéréopneumocystographie)) *J. urol. méd. Par.* 1946-947 53 89.

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This structure, which the authors have designated a pseudosphincter for reasons which will become apparent, was clearly seen in 8 cases of a total of 31 paraplegics studied. It was situated in the prostatic urethra just distal to the colliculus seminalis in the region of the inferior crista. In half of the cases the pseudosphincter was pale with a sharp edge, and although completely surrounding the urethra, its dorsal side more or less tapered into the inferior crista which still could be seen throughout its entirety. In the remaining 4 cases, the pseudosphincter was more fully developed. It was pinkish red with a well rounded corrugated edge, and its dorsal side was raised above the level of the inferior crista which, although obliterated at this level, could still be seen running



Fig. 2 (Menzies). Bladder deformed by the catheter. Diastasis on the right side one of which has a long pedicle. Intravesical projection of a prostatic adenoma which extends to the left lateral wall of the bladder.

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PRELIMINARY PROGRAM FOR 1947 CLINICAL CONGRESS, THE WALDORF ASTORIA, NEW YORK, SEPTEMBER 8 TO 12 1947

THE American College of Surgeons will hold its thirty third annual Clinical Congress in New York from September 8 to 12 with headquarters at The Waldorf Astoria. The five-day program includes operative and nonoperative clinics, scientific sessions in surgery and the surgical specialties, hospital conferences, showings of medical motion pictures, official meetings, and educational and technical exhibits. As one of the leading medical events of the year the Clinical Congress provides excellent opportunities for presentation of the latest developments in surgery and related fields, and its educational value for the individual surgeon and the entire profession is well recognized.

All types of instructional methods are employed first hand observation in the operative clinics, visual demonstration in nonoperative clinics and in surgical films, lecture type presentations in symposia, formal addresses, such as the Presidential Address and the Martin Memorial Lecture forums in which a great many speakers can participate, informal panel discussions in which descriptions of new ideas and techniques may be described and commented upon, scientific exhibits in which developments in surgery and activities related thereto are portrayed in chart and graph form and displays of new equipment and other products in which technical developments which increase the efficiency of the surgeon may be studied.

CLINICS

The New York Committee on Arrangements has appointed a clinic committee composed of representatives of the New York hospitals which will participate in the clinical program. Every effort is being made by both of these committees to insure a clinic program that will give the visiting surgeons a comprehensive idea of the surgical resources of the New York metropolitan area, with the program of the general hospitals arranged to cover clinics in general surgery, obstetrics and gynecology, fractures, orthopedic surgery, thoracic surgery, neurosurgery, genitourinary surgery and ophthalmology and otolaryngology. Special hospitals will also arrange clinics in their fields. General and special demonstrations will be held on subjects such as fractures, cancer, maternal morbidity and end-result studies, new diagnostic and therapeutic procedures, preoperative and postoperative supportive treatment, anesthesia and reconditioning.

PRESIDENTIAL MEETING

The Presidential Meeting will be held on Monday evening September 8 in the Grand Ballroom. The program will include the inaugural ceremony for the incoming officers. Dr. Irvin Abell will give the Presidential Address. Dr. Allen O. Whipple of New York, Clinical Director of Memorial Hospital for the Treatment of Cancer and Allied Diseases will present the second Martin Memorial

GENITAL ORGANS

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The prostatic urethra, in the 8 cases, was dilated varying from an early funnel urethra to one with a large saccular dilatation and the pseudosphincter always formed the distal boundary of the dilated portion. At first it was thought that the pseudosphincter might be a relative structure, formed as a result of disparity between the size of the lumen of the proximal prostatic urethra and its distal portion. Further study obviated this possibility. In the first place mere dilatation should produce a sphincteric appearance only when looking toward the narrow lumen from the dilated portion, not when viewing the structure from the opposite side. In the second place, 8 other cases with dilated posterior urethras showed only a tendency to pseudosphincter formation; the structure was so poorly defined in these cases that the authors considered it unjustifiable to label it a pseudosphincter. In the third place, in the 8 cases in which it was definitely present, the pseudosphincter was conspicuous under all conditions of examination, i.e. whether the water was running or not, and whether the scope was close to the structure or withdrawn for a distance.

Transurethral resection was performed on 3 of the cases merely to obtain suitable specimens of the pseudosphincter and internal sphincter for microscopic study and not as a method of treatment. These two structures were resected separately and individual bites were removed immediately and not permitted to float back into the bladder. These precautions prevented any possible confusion as to origin of the pieces.

The findings in the 3 cases were similar. Microscopic examination of the pseudosphincter revealed transitional epithelium lining the structure. The wall was composed of loose and dense connective tissue which was byalinized in areas. There was an extensive acute and chronic inflammatory process with edema which threw the overlying epithelium into folds. The inflammatory cells were densely arranged and located chiefly in the subepithelial tissue and they were composed of lymphocytes, polymorphonuclear leucocytes, mononuclears, and histiocytes intermingled in a rich number of distended capillaries. The submucosal glands were lined by transitional epithelium and showed marked hyperplasia. There was a small amount of muscle tissue found with Van Gieson stain. Portions of the prostate lying at the base of the pseudosphincter showed evidence of chronic inflammatory processes in which there were periglandular collections of lymphocytes and mononuclear cells and an increase of interstitial connective tissue. Compared with sections of the internal sphincter taken at the same sitting the latter was also lined by transitional epithelium showing a similar but less extensive inflammatory process. The wall however contained abundant muscle bundles.

JOHN A. LOFF, M.D.

Landsteiner, E. K. and Brown, H. P.: Observations on the Treatment of Carcinoma of the Prostate by Orchiectomy. *Am J M Sc.* 1947 213 450

The effects of orchiectomy in 35 cases of carcinoma of the prostate were studied. The patients were observed for periods varying from 6 months to 4 years. They varied in age from 53 to 87 years. Of the 35 patients 20 had a positive microscopic diagnosis of carcinoma of the prostate while in the remaining 15 the diagnosis was made by physical findings, elevated acid phosphatase and roentgen ray evidence of bony metastases.

Of the patients having metastases, approximately two-thirds experienced moderate to severe pain preoperatively. In practically all of the cases surgical castration was followed by amelioration of symptoms within 48 hours. This rapid response suggests that pain as such is due more likely to pressure on or actual involvement of the nerves by carcinoma (usually in the lymphatics or lymph nodes) rather than by intraosseous growth which will show no detectable change by the roentgen ray in so short a time. Little improvement can be expected in cases in which the bony metastases destroy the normal contour of the vertebral column. On the other hand where pain is caused by peripheral nerve involvement one may expect relief in a majority of the cases.

Along with other observers, the authors have found that patients who were bedridden and required large doses of opiates were able, in several instances, to resume their former occupations and no longer required sedation.

As might be expected improvement in well being and appetite paralleled relief of pain in almost all instances. This improvement may be very rapid and dramatic.

In the present series of 35 cases 18 patients had evidence of metastases, as seen by the roentgen ray. In the bones there were no constant changes which could be interpreted as signifying regression. Most frequently the osteoplastic metastases became more calcified and appeared more discrete. In a few cases there was no significant change, and two cases only showed decreased density of the osteoplastic lesions with a partial restoration of normal bone architecture.

A very favorable change in the roentgen ray appearance of metastases occurred in one of 2 patients having metastases to the lung fields.

Several patients who showed a progression of metastases by roentgen ray did so in spite of marked clinical improvement.

Although a decrease in size and softening of the original lesion in the prostate was observed in about one third of the patients treated only 5 showed a resulting improvement of urinary function and diminished residual urine. This is not surprising when one considers that in many cases obstruction to urination is contributed to or wholly caused by

benign prostatic hypertrophy which so often occurs together with carcinoma of the prostate.

The authors are of the opinion that if urinary symptoms are severe enough to suggest need for operative interference this should be performed at the same time as orchectomy rather than to wait for possible improvement from orchectomy alone.

Of the 23 patients with metastases, 21 had acid phosphatase values above 4 units. All 21 cases displayed a reduction in the acid phosphatase level after surgical castration, 12 of them ultimately returning to normal. In the authors' experience this is of no prognostic significance since a number of the patients whose acid phosphatase became normal and remained within normal limits succumbed within 3 to 10 months.

Unfortunately there are few if any clinical or laboratory clues which enable one to foretell how any one patient will respond to surgical castration. The length of time during which a patient may be benefited by castration and remain free of pain varies considerably. The shortest period of improvement among the authors' cases was 3 months, while the longest period of improvement to be followed by relapse lasted 24 months. As a rule, the reappearance of pain was coincidental with a rapid deterioration of the patient's general condition and was soon followed by death.

The question of the optimal time for orchectomy has remained unanswered. Many urologists advise withholding orchectomy until metastases or symptoms thereof appear. It has been the policy of the authors in most cases to perform orchectomy when ever the diagnosis of carcinoma of the prostate is made regardless of the presence or absence of metastases.

FREDERICK A. LAUD, M.D.

MISCELLANEOUS

Kretschmer H. L.: Genitourinary Conditions in Infants and Children. *J. Pediatr.* 3 Louis, 1947, 30-603.

A steady stream of contributions by numerous authors have emphasized that age can no longer be used as an alibi against complete urologic examination in infancy and childhood, as, in general, the indications and contraindications for cystoscopy in children and adults are identical. The increasing enlightenment in the realm of pediatric urology has helped to alleviate suffering in the young and prevent much unnecessary invalidism in adult life.

Anomalies of the urinary tract. With the routine use of intravenous urography these have been found to be far more common than was formerly supposed. The mere presence of an anomaly does not indicate surgery unless the former has produced changes such as stone, hydronephrosis, and recurring attacks of pyelonephritis. When pyuria persists longer than 4 or 6 weeks despite intensive medical therapy a complete urological examination should be carried out.

Supernumerary kidney is very rare and has been discovered only in the adult.

Simple renal ectopia or dystopia does not begin to produce symptoms until adult life. The possibility of its occurrence in children should however be borne in mind.

Solitary kidney. Symptoms may be pain, hematuria, pyuria, or anuria, and it is important to utilize all modern diagnostic methods so that the condition is recognized. Conservative surgery is employed, and the error of removing the solitary kidney is prevented.

Horse-shoe kidney or fused kidney. The author has seen only one child with a fused kidney. This condition is readily recognized in the plain roentgen film or pyelogram.

Renal hypoplasia. The clinical importance of this anomaly is that the small amount of renal tissue present, when bilateral, is not sufficient to sustain life. The hypoplastic kidney is more subject to infection than the normal kidney.

Double kidney and double ureter. Both of these conditions occur quite frequently and often without symptoms. Their mere presence does not indicate operation. In the presence of chronic pyuria, hydronephrotic changes in one-half of the double kidney and recurring attacks of pyelonephritis, only heminephrectomy will effect a cure. As a rule the upper and smaller half of the double kidney is the one harboring the lesion.

Polycystic kidney is rarely seen in children except at necropsy because clinical manifestations usually do not appear until adulthood.

Solitary cysts of the kidney are rare in children.

Ectopic ureteral orifice occurs more frequently in the female than in the male and is often overlooked for years. The ectopic orifice in the female may be located in the urethra, adjacent to the external urethral orifice, in the vagina, or in the uterus. In the male it may be found in the prostatic urethra, the prostate itself in the seminal vesicle or in the vas deferens. A careful history will elicit the fact that the patient is "wet all of the time," losing urine continually day and night, irrespective of the act of micturition. The diagnosis is made by finding the ectopic ureteral orifice, which, in girls, can readily be located with good exposure, proper light, and a discerning eye. As a rule the ectopic ureter drains the upper half of a double kidney. As a result of this anomaly this half of the kidney undergoes hydronephrotic atrophy and frequently is infected. The treatment is heminephrectomy.

Ureterocele. Although this condition is relatively uncommon, it is important because of its devastating effect on the kidney. Hydronephrosis is always present due to interference with drainage. When infection is superimposed, chills and fever with marked pyuria lead to a diagnosis of pyelitis and medical treatment is given for long periods of time to no avail. The diagnosis is readily made on cystoscopy or in the cystogram obtained with intravenous urography in which a large filling defect appears in the bladder shadow. In early cases the ureterocele is best treated by electrocoagulation or by resection with the resectoscope. In advanced cases with severe hydro-

nephrosis, nephrectomy of the single kidney, and heminephrectomy of the double kidney may be necessary.

Congenital stricture of the ureter. In the majority of these cases the primary lesion is not at the ureterovesical junction but at the neck of the bladder with obstruction to urination with hypertrophy of the bladder wall and a resulting compression of the intramural portion of the ureter. The treatment consists of removing the obstruction at the bladder neck.

Bladder diverticulum is usually overlooked in children because of the absence of a typical symptom complex. Practically all cases are congenital and secondary to obstruction at or in front of the bladder neck. The treatment is directed toward removal of the obstruction. Only in the case of large diverticula especially when they do not empty and infection persists is diverticulectomy necessary.

Exstrophy of the bladder. The determining factors in deciding upon operative intervention are the competency of the rectal sphincter in the individual case and whether infection has been introduced into the kidneys. The author prefers to wait until the child is 18 months or 2 years old and to transplant one ureter at a time.

Obstructions at the vesical neck. These may be of either mechanical or neurological origin. The causes may be located at the bladder neck or in front of it and may be classified as follows: (1) contractures at the internal urethral orifice (2) median bars (3) valves in the prostatic urethra (4) hypertrophy of the verumontanum (5) lesions of the central nervous system (6) lesions of the prostate and (7) extravascular lesions.

The diagnosis can be made from the history and the physical examination. It should be made early before irreversible changes have occurred in the upper urinary tract.

Contractures of the vesical neck may be due to a muscular hypertrophy or a fibrosis of the vesical neck. The obstruction is removed by transurethral resection or suprapubic cystostomy and resection.

Extravascular lesions. Retroperitoneal lesions, such as tumors both benign and malignant, may produce obstruction with hydronephrosis. As the tumor enlarges a lateral displacement of the ureter occurs.

Congenital valves of the posterior urethra. If this condition is not relieved the effects upon the upper urinary tract are devastating and irreversible. Congenital valves may be destroyed by the fulgurating electrode or the resectoscope.

Hypertrophy of the verumontanum is often not diagnosed. This condition may produce severe obstruction with a resulting bilateral hydroureter and hydronephrosis.

Lesions of the central nervous system. The common cause of neurogenic bladder disturbance in children is spina bifida, which is usually recognized in the plain roentgen film.

Lesions of the prostate. Sarcoma of the prostate may be mentioned as a rare cause of urinary obstruction in children.

Undescended testicle. An undescended testicle is generally discovered during a routine physical examination by the pediatrician. One must differentiate between a true undescended testicle and a highly retractile testicle. The author believes that true undescended and ectopic testes always require surgical treatment and that endocrine therapy should be avoided because it may result in glandular imbalance or other systemic disturbances.

Surgical tuberculosis of the kidney. Surgical renal tuberculosis can be cured when the process is limited to one kidney, and when the diagnosis is made early the prognosis is excellent. The true incidence of renal tuberculosis is much higher in childhood than the present collected data seem to indicate. One must bear in mind the possibility of renal tuberculosis in children who present persistent pyuria and relapsing pyelitis. If the diagnosis of unilateral renal tuberculosis is made from the urologic examination one should rarely resort to retrograde pyelography. Nephrectomy is the proper treatment for unilateral renal tuberculosis.

Urinary calculus is seldom seen in the young in the United States, due to better sanitation, improved dietetics and better care by the pediatrician but it does occur frequently enough to warrant its serious consideration. In the very young, the symptoms of stone are abdominal pain, vomiting, diarrhea and convulsions. As the gastrointestinal symptoms are very prominent, the presence of urinary calculi is not suspected and they are found only on routine x-ray examination. Pyuria is the major symptom of urinary stone in children. If there is hematuria accompanied by recurrent colicky pain a stone should be suspected. The pathological changes associated with the urinary calculus are the same in the child as in the adult. The diagnosis and the treatment are also the same.

Hydronephrosis. Before the era of pediatric urology most of the cases of hydronephrosis and hydroureter were not recognized and the early literature deals with cases found at autopsy. As in other urologic diseases it is imperative that early diagnosis be made so that early treatment can be instituted if irreparable damage to the kidney is to be prevented. As a rule most of these cases come to the attention of the physician after the onset of infection. Because of the presence of pyuria with chills and fever many of these cases are erroneously diagnosed as acute pyelitis or acute cystitis. Hydronephrosis and hydroureter may result from (1) obstructions in the lower urinary tract anywhere along the course of the urethra from the external meatus to and including the vesical neck, (2) obstruction at the ureterovesical junction, (3) obstruction at the ureteropelvic junction (anomalous vessels are not frequently found as a cause) (4) pathologic conditions extrinsic to the urinary tract (this is rare and when found is generally associated with retroperitoneal tumors) (5) lesions of the central nervous system (spina bifida) the treatment depends upon the cause.

Tumors of the urinary tract. Bladder tumors are rare in childhood. The common tumor in infancy

and childhood is the sarcoma. Unfortunately these cases are usually seen late so that the possibility of surgery effecting a cure is exceedingly remote. Kidney tumors are almost always of the type first described by Wilms, and they are now called Wilms tumors. They are congenital in origin. Of the three constant symptoms of renal tumors in general, namely a visible or palpable tumor, hematuria, and pain, only the first is constant in malignant renal tumors of children. The abdomen swells gradually becoming asymmetrically or symmetrically global. These tumors are usually discovered late because of the absence of pain and hematuria. Differential diagnosis involves excluding other renal lesions, of which hydronephrosis is the commonest, and other retroperitoneal lesions, such as sarcoma and lipoma. In other retroperitoneal tumors the ureter as demonstrated by the shadowgraph catheter is displaced laterally. The diagnosis is based upon the presence of a palpable tumor and changes in the urogram. A plain x-ray of the chest is indicated to rule out metastases. Since the metastases are usually blood-borne, indeterminate and repeated palpation should be avoided strenuously once the diagnosis has been made.

The author prefers to combine x-ray therapy with operation. A course of deep therapy is given before operation. Although not all Wilms tumors respond, the majority show a rapid diminution in size. When the tumor no longer diminishes in size having become stationary nephrectomy is carried out at once and this is followed with a course of postoperative irradiation. This technique has resulted in a great reduction of the operative mortality which today is practically nil since the diminution in the size of the tumor makes nephrectomy a simple procedure.

FREDERICK A. LLOYD, M.D.

Ferguson, C., and Hershey T. S.: Streptomycin in Urogenital Infections. *J. Urol. Balt.* 947 57 932.

The authors studied the results of streptomycin therapy in 44 cases of urinary tract infection 42 of which were produced by gram negative organisms.

Urine was obtained from these patients by thoroughly cleansing the meatus with 1-4000 mercuric alkaline cyanide. The patient was instructed to start voiding. After several ounces were passed, the sterile container was unplugged and the urine was obtained in this manner for culture. This method was found to be more practical than the passage of a rubber catheter as it is believed the catheter and lubricating jelly offer more opportunity for contamination than the above method.

The first individuals were treated with relatively small amounts of the drug at 3 hour intervals. This method was later changed to a more intensive therapy at 1 hour intervals, and larger amounts of the drug. At the present time the authors are employing 0.2 gm. intramuscularly at 2 hour intervals. They are of the opinion that not less than 5 gm. of the drug should be given in ordinary infections and that those of a severe nature should receive at least 10 gm. Their findings confirm the experience of others that where a local condition exists such as obstruction in the urinary tract or calculi which have not been removed the infection may be cleared by streptomycin. It is, however, prone to recur unless the predisposing factors are removed.

The urinary infections studied on the whole responded favorably to treatment with streptomycin.

The drug appears to be largely excreted through the urine. A good concentration is obtained in the urinary tract.

An excellent table of the 44 cases treated is appended, in which the diagnosis, the results of cultures before and after treatment, associated local pathology, the immediate and total dosage and the results of treatment are listed. An interesting observation to be made from a study of this table is in regard to the response of *Bacillus pyocyaneus* infections to streptomycin therapy. In 18 cases in which this organism was present in pure culture or in a mixed infection, it was eliminated in 11 by a total dosage of the antibiotic, varying from 2 to 10 gm. In all 3 such cases in which 10 gm. were employed the organism was eliminated.

FREDERICK A. LLOYD, M.D.

SURGERY OF THE BONES, JOINTS, MUSCLES, TENDONS

CONDITIONS OF THE BONES, JOINTS, MUSCLES, TENDONS ETC.

Langenakiöld A.: Normal and Pathologic Bone Growth in the Light of the Development of Cartilaginous Foci in Chondrodysplasia. *Acta chir scand.* 1947 95 367

Under the name of chondrodysplasia, the author includes enchondromatosis and multiple exostosis. A combination of the latter 2 diseases is also referred to as Ollier's disease in English and American textbooks.

Röntgenologic studies of Ollier's disease reveals a bony defect either at or near the epiphyseal plate, which grows parallel with the longitudinal trabeculae and appears as if long chips of bone had been surgically gouged out. Histogenetically these foci represent a disturbance between the epiphyseal plate and the periosteum. Persistence of undifferentiated cartilaginous cells when they migrate toward the diaphysis of the long bones from the fibrocartilaginous epiphyseal plate constitutes non-ossified foci in Ollier's disease. In the main the foci retain their chondrogenic properties instead of merging into the osteogenic layer of the periosteum.

The article illustrates roentgenograms of a child 3½ years of age whose case was followed up for 2½ years. The bones exhibiting the characteristic lesions were both ends of the left femur, the lower end of the right femur, both ends of the right fibula and tibia, and the upper half of the left humerus respectively.

On the pathogenesis of multiple cartilaginous exostoses the author quotes several writers, one of whom states that the arrest in the extension of the periosteal ring permits the cartilage of the diaphyseal disc to become exposed on the surface of the shaft and thus leaves it uncovered and free to give rise to irregular outgrowths or exostoses.

His own opinion, however, is that there is a disturbance in the differentiation of a limited portion of the undifferentiated connective tissue within the epiphyseal cartilage. Due to failure of this tissue to pursue the laws of normal differentiation, growth and resorption of exostoses will invariably ensue.

Enchondromatosis differs from Ollier's disease in that it may originate from the epiphyseal plate as well as from the periphery of the metaphysis. Out of this minute discrepancy the pathogenesis of the two diseases is quite similar.

Achondroplasia can be elucidated by a periosteal streak which develops in the epiphyseal plate of which the connective tissue layer is saturated with dynamic osteoblastic potentialities. In brief bone formation ensues in the epiphyseal plate and hence displaces the basic connective tissue (for the continuity of chondrogenic activity) and substitutes premature bone.

SAMUEL L. GOVERNALL, M.D.

Fairbank, Sir Thomas: Dysplasia Epiphysealis Multiplex. *Brit. J. Surg.* 1947 34 225

Fairbank reports a condition which he regards as a clinical entity. The chief characteristics are dwarfism, stubby digits, and mottling or irregularity in density and outline of several of the developing epiphyses.

With regard to the differential diagnosis, there are at least 7 other conditions besides osteochondritis in which the epiphyses may show irregular ossification. Cretinism is the first general condition to be excluded. The fingers are thick and stubby but fail to show their usual differences in length. Delay in fusion at the epiphyseal line in cretinism is associated with sclerosis of the terminal layer of the metaphysis.

In dysplasia epiphysealis punctata (as it is now called) or stippled epiphyses, the whole of an epiphysis seems to be ossifying in a large number of discrete centers. The shafts of the long bones are short and thick, and the ends may be enlarged and splayed. The abnormalities generally are much more gross than in most cases of the multiplex group and no difficulty should be experienced in differentiating the 2 conditions. Congenital cataract occurs in about half of the cases.

In chondro-osteodystrophy of the Marquis-Brailsford type but not in gargoylism as a rule the femoral heads show striking epiphyseal changes, but in this condition the acetabula are markedly enlarged and irregular. Other epiphyses and the carpal and tarsal bones frequently show irregularity in ossification but notable features are the abrupt kyphotic deformity in the dorsolumbar region resulting from the diminution in size of one vertebral body which is displaced backward and the shape of the vertebral bodies. In the latter the central prolongation anteriorly is quite distinctive and diagnostic.

In dyschondroplasia, changes in the epiphyses when seen are of no importance, as these are completely overshadowed by the gross abnormality of the metaphyses. They are usually, but not invariably, unilateral in distribution. In that skeletal curiosity called osteopodkiloia, the epiphyses are of normal shape and whether fused to the shaft or not show large numbers of the characteristic discrete dense spots, although these are by no means confined to the epiphyses. In osteopetrosis or marble bones some of the epiphyses may show irregular density or stippling but the changes in the shafts dominate the picture.

Lastly mottled epiphyses have been described in association with pituitary gigantism (Traub 1939). Some mottling particularly of the femoral heads has been observed very occasionally in other endocrine disturbances and in cases which at present cannot be classified.

The author made a study of the characteristics of this condition found in 20 cases. The essential fea-

tures are as follows. It is an affection of children and young people—the ages varying from 6 to over 40 years. One of the cases first seen when the patient was 14 years of age has been followed for over 20 years. Both sexes (12 males, 8 females) are affected and, as a rule, the condition is not inherited or familial. Intelligence is usually normal. In 8 of the cases difficulty in walking was complained of while in at least 5 others pain and stiffness of the knees or hips was the trouble which caused the patients to enter the hospital. Some degree of dwarfism, of the short limb type, is the rule. It being definitely recorded in 16 of the cases. The facies typical of cretinism is absent. Some enlargement of the epiphyses is occasionally seen. The hands are striking, the fingers and thumbs being short, thick, and stubby with blunt ends, but the relative length of the digits being normal. Apart from the dwarfism and the shape of the hands, there is no characteristic deformity but flexion deformity of the knees was found in 3 cases with subluxation in 1 case. In 1 case the elbows were flexed and laxity of the wrists and knees was present. In another a curious deformity of the elbows was seen, the radial heads being subluxated. In yet another there was limitation of abduction of the shoulders and of extension of the elbows while the knees were flexed and the tibial heads subluxated backward. Genu valgum was present in 4 cases, and dislocation of the patella, and bowlegs in 1 case each.

The roentgenological findings indicate that the epiphyses may be late in appearing and backward in development, and fusion with the shafts may be delayed, but the principal change is irregularity in ossification. The epiphyses are irregular both in density and shape, being mottled in appearance and perhaps mulberrylike in outline. Separate subsidiary centers around the main center are common, and this results in some peripheral stippling but this is never carried to the point seen in the punctate type of epiphyseal dysplasia. Eventually the epiphyses become normal in density but the outline, though usually smooth, remains permanently abnormal. Any or all of the epiphyses may be affected but the most common to show typical changes and permanent deformity are the hips, shoulders, ankles, and, less frequently the knees. The heads of the femora (and of the humeri) remain permanently shallow and less convex than the normal.

The ankles show marked obliquity of the joint in the condition under discussion.

The author suggests that if there is reason to suspect pseudotumor in a patient below the average in height it is well worth while to have films taken of the shoulders and ankle to exclude the developmental error which is the subject of this article.

C. FRED GORDON, M.D.

Rocher, H. L.: Pseudo-tumeurs; Léri's Disease. (*La pseudo-tumeur. Maladie de Léri*) *Rev. chir. Par.* 947 33 24.

Léri's disease is a congenital osseous dystrophy characterized by premature and excessive develop-

ment of the epiphyses of the bones of the extremities. The excessive enlargement of the epiphyses causes stiffness of the adjacent joint. The diaphyses are short and hypertrophied. Some epiphyses in the same individual may be underdeveloped. The endochondral ossification of the epiphyseal plates is deranged and results in either hyperplasia or hypoplasia.

Two more cases of this rare disease are added to 2 cases previously reported by the author. A 6 year old boy born to consanguineous parents was brought for examination because of multiple deformities. His birth had been normal, he walked at the age of 17 months, and talked at the age of 1 year. In addition to the joint deformities, there was an umbilical hernia and a left inguinal hernia. The head was large and the root of the nose depressed there was a dehiscence frontoparietal suture, enlargement of the sella turcica, strabismus, and slight lumbar kyphosis. The corneas were turbid. The joints of the upper extremities were thick, not painful, but showed limited range of motion. The hand was paw-shaped and the fingers were kept in slight flexion with extension limited to 10 degrees. The x-ray examination showed a large humeral epiphysis. The diaphyses of the humerus, radius, and ulna, and the metacarpals and phalanges were short and thick. The ossification centers of the carpus were present but small. The ossification center of the distal end of the radius was absent. There was coxa valga without enlargement of the upper end of the femur. The knees were large and their motion was limited to 160 degrees. The ossification center of the upper tibia showed deficiency in its development.

The second patient showed similar findings.

The changes found in Léri's disease could be classified as achondroplasia. The stiffness of the joints, however, which is never observed in achondroplasia, makes Léri's disease a separate entity. The hands, for example, are shaped similarly as the hands observed in achondroplasia. In Léri's disease the joints of the hand are stiff and the range of motion is considerably reduced.

The lack of transparency of the cornea suggests a pathogenic relationship between the ill developed corneal mesenchyme and the irregularly developed preosseous mesenchyme. Heredity did not play any part in the cases presented by the author.

There is nothing known as to the etiology of this condition. In view of the deformed pituitary fossa, a deficiency of the pituitary gland might be an etiological factor. GROSS, L. RICH, M.D.

Platt, Harry: Sarcoma in Abnormal Bones. *Bull. J. Surg.* 947 34 3.

The author discusses 180 fully documented primary malignant tumors of bone 161 of which belonged to the sarcoma group and 18 of these were sarcomas occurring in abnormal bones. This subgroup contained (1) 10 sarcomas occurring in Paget's disease (2) 2 sarcomas arising in fibrocystic disease

and (3) 6 tumors representing the malignant transformation of a previously benign osteochondroma.

The incidence of sarcoma in osteodystrophia deformans has been estimated by various observers as between 5 and 10 per cent. In the present series 8 of the patients were males and 2 females. The malignant tumors appeared in 4 patients between the ages of 50 and 60, and in 6 patients over 60. Four tumors involved the femur (lower end 3 upper end 1), 4, the humerus (upper end 2 in the same patient and shaft, 2) and 3, the pelvis (ilium, 2 pubis, 1). In the majority of the cases there was a fairly long prodromal stage in which Paget's disease was present either in one bone or throughout a considerable tumor. The histologic type of tumor in all cases was a spindle or polymorphic sarcoma.

The prognosis in the sarcomas in Paget's disease would appear to be grave. In 7 of 10 cases in the series the patients died within a year from the discovery of the tumor and its treatment. One patient, only a man of 67 with a sarcoma of the humerus, has so far survived a year from the time of amputation. The appearance of sarcoma in an area of fibrocystic disease is a rare phenomenon. In the 3 recalcitrant cases the survival periods were 2 years and 9 years respectively. In the former there was an inoperable tumor of the pelvis of gigantic size. At the time of death no evidence of metastasis was revealed. Because of his experience with these rare cases the author concludes that it is best to obliterate cysts in adults by appropriate operative procedures (curettage and the implantation of bone grafts). In the type of sarcoma resulting from the malignant transformation of an osteochondroma (6 cases in the series) examples of long survival periods are likely to be encountered. Although rapid growth and the attainment of enormous size are not in themselves conclusive evidence of the advent of malignant change such tumors should be eradicated without delay.

C. FRED GOEDIKOW, M.D.

Bennett, Granville A.: Malignant Neoplasms Originating in Synovial Tissues (Synoviosarcomas). A Study of 32 Specimens Registered at the Army Institute of Pathology during the War 1947-29-259.

During the years of the recent war a large number of neoplasms and neoplastidlike lesions, originating in joints, bursae tendons and tendon sheaths, were submitted to the Army Institute of Pathology for interpretation and classification. A review of this material has demonstrated that 32 specimens conformed in their cytological and structural features to the malignant neoplasm of synovial membrane origin. An illustrated descriptive analysis of these lesions together with a tabulation of essential clinical information forms the basis of this report, which is presented for the purpose of familiarizing both surgeons and pathologists with this important group of sarcomas.

The remaining lesions of synovial origin included numerous examples of the giant cell tumor of the tendon sheaths and joints, pigmented villonodular synovitis, and xanthomatous tumors of the joints. A few representative lesions are illustrated in order to permit a comparison of their microscopic appearances with those of the malignant tumors. Such a comparison would seem appropriate since it has become evident that it is not always easy to distinguish between benign tumorous overgrowths and malignant neoplasms.

There is historical evidence suggesting that in some instances at least, a malignant tumor (synoviosarcoma) may develop in or near a joint or some other synovial lined structure that has been swollen or otherwise abnormal for many months or years. It is highly desirable therefore to follow up for subsequent analysis all patients from whom benign neoplasms or other tumorlike lesions of synovial tissues have been removed. Such a study of the vast amount of material now registered with the Army Institute of Pathology should give more precise information as to whether benign lesions may acquire malignant qualities as well as provide histological criteria which would sharply delineate between the innocent lesions and those that are potentially dangerous.

The usual treatment employed in this series was local excision followed in many instances by wider excision or amputation at a considerably later date. Thus it is essentially similar to that reported in previous studies in which the fatality rate from metastases was exceedingly high.

Because of the demobilization procedures it has not been possible to obtain recent follow-up information in many of the cases of the present series. No progress notes have been obtained from 8 patients. It is known however that 11 of the patients died with widespread metastases. In 3 additional patients metastases are known to be present, and in 3 others recurrences have been reported. This points to the seriousness of this neoplasm and emphasizes the necessity for its prompt and complete removal.

If the present discouraging death rate is to be lowered there must be closer co-operation between the surgeon and the pathologist. The pathologist must develop skills and techniques which will enable him to interpret these lesions properly and the surgeon must take the necessary means to eradicate the local lesions without resorting to preliminary conservative measures.

RODOLPH S. REICH, M.D.

SURGERY OF THE BONES, JOINTS, MUSCLES, TENDONS, ETC.

De Anquin, Carlos E.: Mommensen's Osteotomy as a Palliative Operation on the Hip (La osteotomía de Mommensen entre las operaciones paliativas de la cadera). *Rev. arq. traumat.* B. Air., 1946 16 21.

Because of the destructive character of congenital hip lesions total reconstruction is impossible.



Fig. (De Ansky). The excellent results from Mommson's osteotomy.

Hence only palliative intervention is indicated. Kirmison in 1892 utilized a subtrochanteric oblique osteotomy for the correction of this lesion. Lorenz and Baeyer simultaneously proposed bisection of the femur and anchorage of the superior fragment by utilization of the pelvitrochanteric muscles. The lower section of the femur was placed in 45 degree abduction and in from 5 to 20 degrees of hyperextension. With this procedure they created a Y-shaped femur. Schanz bisects the femur at the level of the ischium using this structure for support of the femur.

The bad features of each repair are discussed and the author believes that Mommson's method satisfactorily overcomes these. He describes the technique in detail. A 3 cm. incision is made over the external part of the femur so that the part to be resected is at the level of the ischium. This is determined with x-ray views. The femur is transected from without in as far as the medulla and again outward from within several centimeters lower.

The 2 parallel cuts are joined by a perpendicular one. The lower part of the femur is now abducted, and a body cast which incorporates the leg is applied and left in place for from 30 to 40 weeks.

A case report is presented. The accompanying illustration shows the excellent end results.

STEPHEN A. ZIEGLER, M.D.

Wilson Philip D: Trochanteric Arthroplasty in the Treatment of Ununited Fractures of the Neck of the Femur. *J Bone Surg.* 1947 29: 3-3.

The term "trochanteric arthroplasty" is used in this article to designate an operation on the hip, in which the head and neck of the femur are removed and the trochanteric end of the shaft of the femur is reshaped covered with a vitallium cup or mold and then placed in the acetabulum. As a preliminary step the tip of the greater trochanter is cut away from the rest of the femur the attachments of the gluteus medius and gluteus minimus being preserved. This fragment is later transplanted to the shaft of the femur distal to the greater trochanter.

The operation is a development of the ideas of Whitman, Colonna and Smith Petersen.

The various steps of the operation are clearly shown in illustrations accompanying the article.

The hip is maintained in a position of abduction and extension for a period of from 4 to 6 weeks, generally in a plaster of Paris spica. The knee joint may be freed at a considerably earlier period to permit mobilization and exercises. Following removal of the plaster mobilizing exercises of the hip are started. Weight bearing is not permitted until the end of from 8 to 10 weeks, and then only with crutches.

The chief complication that must be guarded against is luxation particularly during the first 3 weeks after the plaster is removed.

A summary of 9 cases in which operation was performed by this method shows the results were excellent in 4, good in 3, cases fair in 1 case and poor in 1 case.

The writer does not propose trochanteric arthroplasty as the proper method of treating all ununited fractures of the neck of the femur. However trochanteric arthroplasty has two advantages over the usual arthroplasty of the femoral neck. First, it eliminates the neck of the femur and for an angular thrust, it substitutes a direct vertical thrust in the axis of the femur. This simplifies the mechanics of hip function and reduces the likelihood of instability due to insufficiency of the iliofemoral muscles. Second, there is a more abundant blood supply to the trochanter than to the femoral neck, hence there is less chance of postoperative absorption of bone which is frequently a troublesome feature after arthroplasty of the femoral neck.

These advantages are sufficient to more than counterbalance the single disadvantage which is the tendency of instability of the hip in the early postoperative period and the necessity of taking certain precautions to guard against luxation. Perhaps eventually a way will be found to make these hips more stable by surgical implantation of a bone shelf.

While trochanteric arthroplasty is particularly indicated in the treatment of certain ununited fractures of the neck of the femur it is also of value in many other pathological conditions of the hip especially those accompanied by destruction of the head and neck of the femur.

RODOLPH S. REICH, M.D.

Parker J. M. and Modlin J. J.: Compound Injuries of the Knee Joint. Study 2—The Infected Knee Joint. *Ann. Surg.*, 1947 125 385

World War II has witnessed a significant change in the surgical treatment of severely traumatized and infected knee joints. Rather than merely the saving of a limb or a life, the conservation of function has become the goal. The conclusions are based on cases seen at the Twenty-first General Hospital, St. Louis, Missouri (Washington University Unit) during the African, Italian, and French campaigns. Established infection can be controlled and a functioning joint obtained by (1) removal of all actually or potentially devitalized tissue and foreign material which can serve as foci of infection, (2) control of the residual infection by the systemic and intra-articular use of penicillin, (3) closure of the knee joint to exclude re-infection from without, and to insure retention of the penicillin, (4) the institution of early active motion.

The infected joint most amenable to the therapy outlined by the authors is the one with minimal fracture rather than one with extensive fractures and soft tissue loss. A total of 244 penetrating and perforating wounds of the knee joint were treated. Clinical infections developed in 29 of these. The infections are classified as acute, subacute and chronic, the latter being most subtle and most likely to escape diagnosis.

The gross pathology of the different stages is described. Attention is called to the menisci which early appear viable but in later stages degenerative signs such as dullness, softening, and yellow discoloration are frequently noted. In the chronically suppurating joint, menisci are generally found to be degenerated, erosion of opposing cartilaginous surfaces is present, and the joint cavity is partially obliterated by adhesions.

By arthrotomy and by observing the criteria mentioned herein, the authors believe that definite advantages were gained over prior methods of drainage and immobilization. Of the 15 patients selected for this method of treatment, 14 were considered to have had a successful result from the standpoint of arrestment of the infection and preservation of a serviceable knee joint.

Although basic tenets were débridement including excision of the menisci, closure of the joint, and institution of penicillin, the extent of débridement varied in the different stages of the infected knee. In the acute septic knee, menisci were removed by medial and lateral parapatellar incisions despite appearances because of known low vitality and susceptibility to infection, as indicated from the study of knees in the later stages. In the subacute stage, the meniscus on the side of the injury was removed and decision as to removal of the opposite meniscus was made upon examination at surgery. With developing chronicity, good functional results are less frequent. Usually both menisci are found to be degenerated and areas of necrotic cartilage are present. In such cases, the menisci are removed and devitalized cartilage is curetted to good bone. If the procedure is too

extensive to expect minimal joint function, resection of the joint may be performed.

Both menisci were removed in 8 of the 15 patients; the lateral meniscus alone was removed in 5, and the medial meniscus was excised in 2 patients.

The remaining 14 infected knees in the series of 29 cases were considered too extensive to be amenable to arthrotomy and débridement. Four of these knee joints were resected to control infection. One of the patients in whom resection was done required subsequent amputation to control fulminating osteomyelitis.

KENETH H. SPORNEL, M.D.

FRACTURES AND DISLOCATIONS

Stark, W. J.: The Value of External Skeletal Fixation in Elective Orthopedic Surgery. *Ann. Surg.* 1947 125 373

The Roger Anderson apparatus has been used frequently for the treatment of fresh fractures, but the present study comprises 57 elective orthopedic procedures in which it was used (bone grafting to old

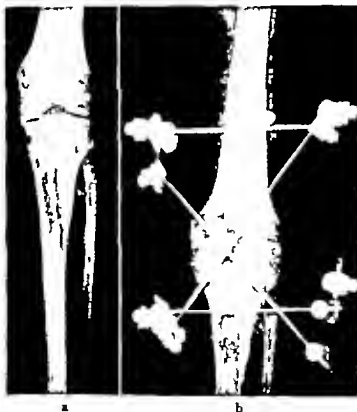


Fig. 2 (Stark). a, Roentgenographic appearance of knee joint 20 months following a compound fracture of the tibia (gunshot wound) involving the knee joint originally with osteomyelitis and septic arthritis. b, Anteroposterior view of a surgical arthrodesis of the knee joint 10 weeks post-operatively. Early union is present. Immobilization discontinued in 14 weeks, when ankylosis was complete. Four $\frac{1}{2}$ inch pins are used and their position is clearly indicated in the roentgenogram. The two oblique pins cross through the knee joint. The articular cartilage is removed from opposing joint surfaces before these oblique pins are inserted.



Fig. (Stark) a. Roentgenograms of compound fracture of the tibia 10 months following gunshot wound. There had been continuous immobilization since this patient was wounded, including 3 months in a walking plaster. The tibia wound had been healed for 8 months. b. Roentgenographic appearance 12 weeks after a sliding bone graft with additional cancellous bone from the opposite tibia. Immobilization discontinued in 16 weeks with union present. c. Photograph of the patient after surgery.

nonunions, arthrodeses, and humeral shortenings). The bone grafts were all full-thickness onlay or inlay grafts, all cancellous grafts being reported separately.

The appropriate size of pin is used for each bone or joint, from a $\frac{1}{32}$ inch pin for the tibia and femur, to a $\frac{1}{8}$ inch pin for the wrist joint. Pins are inserted by a slow speed hand drill to eliminate thermal damage to tissue. Anatomically correct sites must be chosen for the insertion of pins to avoid pin seepage. Pins are inserted before the operative incision is made. In the femur and tibia, through and through pins are used with the half-pin units. After exposure of the site the desired position is secured and maintained by locking the clamps. Application of a graft is then simple. Sterile gauze is secured about the pins and changed infrequently; plaster dressings are not used. Most of the lesions in the author's series were old gunshot wounds, many of which had been infected. Periods of fixation ranged from 30 weeks for the average bone graft to the femur to 12 weeks for a graft to the radius. Similarly the average fixation period for arthrodeses was 30 weeks for an elbow to 12 weeks for a wrist.

A representative group of cases is presented together with photographs and before and after roentgenograms showing the apparatus *in situ* after union had taken place. Pin seepage occurred in 21 per cent

of the cases. It is differentiated from infection about the pins which did not occur in this series, and is due to movement of the soft tissues around the pin. All pin tracts were healed in from 7 to 15 days. No sequestra or osteomyelitis occurred at pin sites. There were 2 cases of delayed union. In 4 cases there was exacerbation of infection in the old compound wound which healed again in from 3 to 8 weeks without involvement of the operative site. Infection of the surgical wound occurred in a mental patient but eventually cleared the graft remaining in place. No renal calculi were present in the group.

The advantages of external skeletal fixation are (1) continuous rigid fixation of the fracture site, (2) simplification of the operative procedure and elimination of the need for plaster casts, (3) early active mobilization of the adjacent joints, (4) early ambulation is permitted (8 to 10 weeks of weight bearing with pins in place), (5) a minimum of nursing care is required and patients are reasonably comfortable. The disadvantages are the dangers of complications as noted above.

FRANCIS E. BRIDGEMAN, M.D.

Allaria, A.: Fracture of the Acromion (*La fratture dell'acromion*). *Chir. org. movim.*, 1945, 50: 425.

In the author's material of 13,860 fractures there were 133 fractures of the scapula (0.98% of all cases). Fracture of the acromion was diagnosed in 18 cases.

(13.23% of all fractures of the scapula, or 1.39 per 1,000 of the entire fracture material)

The differential diagnosis should consider (1) so-called acromial bone or "Ridge's bone" resulting from a deficient process of ossification, and (2) scapular bone, namely the acromial and/or secondary acromial bone.

As to the mechanism of the fracture, direct trauma was responsible for 72.7 per cent of the fractures of the acromion, while indirect trauma to the elbow or the forearm was responsible for the remaining cases.

Inspection of the shoulder from the back reveals characteristic ecchymoses in the acromial region are present. Palpation is painful and inspiration frequently provokes pain but the functional examination may fail to furnish distinct results. From the anatomopathologic and roentgenographic point of view fractures of the acromion may be divided into three groups (1) fractures of the distal extremity (2) fractures of the articular or acromioclavicular portion and (3) fractures of the base of the bone. The first two types are relatively rare.

As to therapy bandaging of the arm to the trunk is sufficient if the fragments are in good apposition. Otherwise immobilization of the arm in the position of abduction and intermediate rotation with the elbow flexed to 90 degrees is suggested by the author. If the fracture is combined with a dislocation, the latter should be reduced first. In exceptional cases introduction of a wire and the application of traction or an open reduction may be required.

JOSEPH E. NARAT M.D.

aply Surgical treatment employs palliative and definitive methods. Palliative treatment is divided into intra articular extra articular and complementary operations. The intra articular operations include resection of the head of the femur pseudarthrosis of the femoral neck, and arthrodesis.

The extra articular operations are the various osteotomies aimed directly at correction of the adduction or correction of the flexions on the one hand and those for the purpose of stabilizing the pelvis, such as the Lorenz bifurcation method, or the Schanz ischial attachment and their modifications.

The complementary operations are designed for the correction of the inequality of the extremities by lengthening the short member or shortening the longer one or by harnessing the fragments.

STEPHEN A. ZIEGLER M.D.

Leveuf J. and Pals, C.: Congenital Dislocations of the Knee (Les dislocations congénitales du genou) *Rev. chir. Par.* 1946 33: 313.

The authors differentiate between 3 varieties of congenital displacement of the knee
1 Congenital genu recurvatum, in which the articular surface of the tibia glides anteriorly on the femur but the contact of the articulating surfaces of the tibia and femur remains preserved

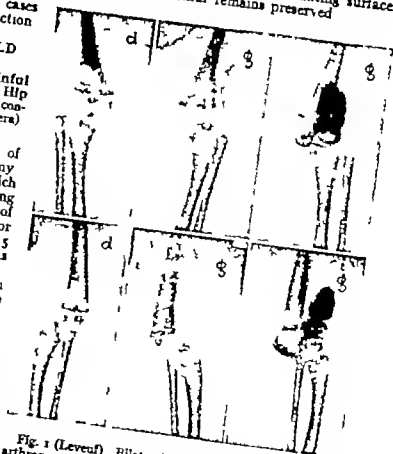


Fig. 1 (Leveuf) Bilateral subluxation of the knee. The arthrogram of the left knee shows the partial loss of contact between the articular surfaces and the overriding of the cartilaginous epiphyses.

Piqué, José Alberto: Treatment of Old and Painful Bilateral Congenital Dislocation of the Hip (A propósito del tratamiento de la luxación congénita bilateral inveterada y dolorosa de la cadera) *Rev. ortop. traumat.*, B. Air 1946 16: 65

Any treatment for old congenital dislocation of the hip should take into account regional anatomy the type of luxation the mechanical changes which occurred during the early stages and the presenting acute symptoms. There are two main types of congenital dislocation of the hip (1) the anterior or supra-acetabulum dislocation which has 5 subtypes and (2) the posteroinferior which has 3 subtypes. The intermediary and the high regional anatomical changes, together with a series of disturbances, produce in time the different types of dislocations, which are conditioned by 4 factors (a) insufficient or absence of femoral stability (b) bad orientation of the bony parts (c) shortening disproportion of the extremities and (d) displacement of muscular insertions while walking. The clinical symptoms are pain, fatigue on walking, slowing of gait, and defective posture. Certain cases of old dislocations are not amenable to surgical treatment and nonsurgical procedures should always be tried before resort is made to any open method. These include rest, and the use of orthopedic appliances, medicine, and physical therapy.



Fig. 3 (Levent) Subluxation of the right and luxation of the left knee. Luxation of the left hip. Anterior and external overriding of the tibia and hypoplasia of the epiphyseal ossification center of the metaphyses and diaphyses of the left femur

2 Congenital subluxation in which the posterior part of the tibial epiphysis articulates with the anterior surface of the trochlea of the femur. The tibial epiphysis is displaced anterior to the epiphysis of the femur

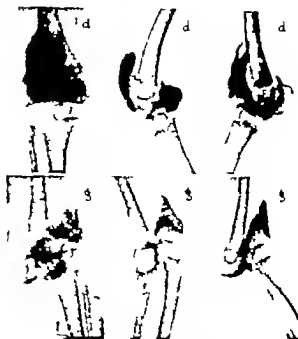
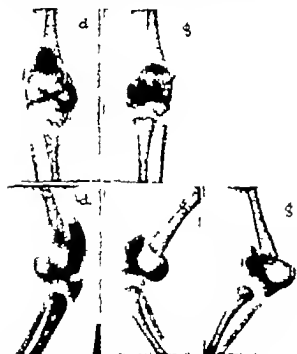


Fig. 4 Arthrogram showing subluxation of the right side during hyperextension and luxation of the left side with marked overriding and interposition of the subpatellar synovial membrane and hypoplasia of the capsule.

Fig. 5 Arthrogram of the left genu recurvatum with tibia in hyperextension hypoplasia of the capsule and cartilaginous deformation of the tibial epiphysis in the form of donkey back.

Fig. 5 Arthrogram of subluxation of the left knee. Overriding of the cartilaginous epiphyses which are hypoplastic. Articular cavity decreased. Convexity of the tibial epiphysis displaced superiorly and anteriorly even during attempts of reduction (last picture).

3 Complete congenital luxation in which no contact exists between the articular surfaces of the two bones. The tibia is dislocated not only anterior but also lateral to the femur

Since the epiphyses are cartilaginous and transparent to the x rays in the newborn, simple roentgenography gives only an incomplete picture of them and of the degree of subluxation or luxation. Arthrography (filling of the glenoid cavity with a contrast medium) permits visualization of the contours of the epiphyses of the whole extent of the joint cavity with its recesses (subquadriceps, subpatellar and popliteal) and of the soft tissues inside the joint (anterior adipose pad, menisci, thickening of the synovia).

There is atrophy and deformation of the epiphyses of the femur and tibia. The quadriceps muscle is atrophic and shortened. In many cases the patella is atrophied and in some cases it is missing. Microscopically the muscles present fatty infiltration, thickening of the perimysium and some times cloudy swelling.

Little is known about the etiology and pathogenesis of this malformation. Just as congenital dislocation of the hip joint, congenital dislocation of the knee occurs about 1 or 3 times more often in girls than in boys. About 60 per cent of the cases in the literature showed other malformations besides dislocation of the knee. Most frequent among these were luxations of the hip and in 10 per cent pes equinovarus was present. Other cases showed spina bifida, anal atresia, hardlip and strabismus.

In genu recurvatum it is sufficient to immobilize the knee in a cast for 2 or 3 months. Subluxation and luxation require either orthopedic reduction or surgery. Orthopedic reduction should be done only under roentgenoscopic control, immediately after the arthrogram has been taken. In attempting to reduce the luxation, one has to proceed very gently as the danger of separation of the epiphysis is great. In surgical reduction, the most important step is the lengthening of the extensor apparatus, either by a simple Z-formed incision of the quadriceps tendon or by the shortening of the quadriceps very marked by more complicated techniques which are discussed in detail. In addition, in cases of luxation it is necessary to open the capsule and to remove the hypertrophic tissue of the synovial membrane between the patella and the tibia.

The authors discuss 5 cases observed by them
WERNER M. SOLMITS M.D.

ORTHOPEDICS IN GENERAL

Cheyne, J.: A Study of the Physio-pathology of the Hip Joint (Recherches sur la physio-pathologie de la hanche). *Rev. orthop.* Par 1947 33 7

Examination of the round ligament in 50 antopsize demonstrated its variation as to length and hip joint. A round ligament however was found in every the iliac artery of fresh adult children and new

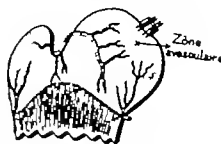


Fig. 1 (Cheyne) The femoral head in the newborn.

born cadavers and the hip joint was then x rayed. A histologic examination was also made of every round ligament.

In the newborn a number of arterioles were found to be located at the periphery of the round ligament. These vessels however do not penetrate into the still cartilaginous femoral head. In the adult, several (about 5) arteries were found to traverse the round ligament in its entire length, converge and penetrate into the osseous portion of the femoral head. In the aged the round ligament showed very poor vascularization. The roentgenograms of the specimens supported the histologic findings. In the adult a definite anastomosis existed between the vessels of the round ligament and the anterior and posterior circumflex vessels. There were a few neurofibria at the periphery of the round ligament which obviously were of little clinical significance.

The femoral head gets its blood supply from 3 sources: the obturator artery through its arterioles within the round ligament, and the anterior and posterior circumflex arteries. In the newborn the anterior circumflex artery fails to supply branches to the femoral head. The posterior circumflex artery before penetrating the femoral head follows a spiral course around the posterior aspect of the head (Fig. 1).



Fig. 2. The paucity of the intrinsic circulation in an individual 70 years of age.

The posterior circumflex artery gives off branches along its course. It never communicates with the round ligament vessels in the newborn. Thus, an avascular area is formed in the superior medial corner of the femoral head which is the exact site where the ossification center seems to appear at the age of 16 to 18 months. In the adolescent, anastomosis between the 3 systems seems to increase more and more (beginning between the ages of 10 and 12 years). In the adult definite and extensive communication between the 3 vascular systems is established.

The anterior circumflex artery gives off a recurrent nutrient branch (Nussbaum) which enters the femoral neck to anastomose with branches of the posterior circumflex artery. The posterior circumflex artery gives off 3 sets of branches: (a) at the inferior border of the femoral neck, i. e. inferior nutrient vessels of the head and neck (Lexter Waldenstrom); (b) branches that enter the posterior aspect of the neck; and (c) superior branches which clinically are the most important. One branch is a recurrent trochanteric branch, and 3 large branches enter the head and neck. The arterioles of the round ligament communicate with the superior and inferior nutrient arteries of the posterior circumflex artery. In the adult there is no avascular zone in the femoral head. In the aged, roentgenograms of the injected specimens clearly show the paucity of the intracapsular arteries of the femoral head, and the lack of anastomosis of the round ligament arteries with the other vascular systems (Fig. 3).

Osteochondritis dissecans of the femoral head (König's disease) in which a small superficial osteoarticular sequestrum is formed is caused by a disturbance of the vessels of the round ligament, i. e. endarteritis obliterans, embolism, or spasm. A similar vasomotor process is most likely responsible for similar conditions in other joints, for example, the shoulder elbow and knee.

A similar process causes Legg-Calve's disease in the hip joint. Anastomosis of the vascular system of the round ligament and the posterior circumflex artery is not established before the age of 10 or 12. It is possible that vasomotor disturbances of the round ligament arteries are responsible for these changes.

GEORGE I. RICE, M.D.

Wilkinson, W. R.: Coccygodynia; Review of the Literature and Presentation of Cases. *South. Surgeon*, 947 3 23a.

Coccygodynia means painful coccyx, but the term refers to a clinical entity which may include other symptoms. This condition may well be called pelvic myoneuralgia.

To understand the relationship of the lesion to the symptoms, the anatomy of the pelvis must be known. The muscles involved are the piriformis, coccygeus, and levator ani, which are components of the pelvic floor. The piriformis muscle is in close relationship in a variable manner with the sciatic and gluteal nerves. The coccygeus and levator ani have attachments on

the coccyx. The writer further expands on the extensive pelvic innervation. From the anatomic descriptions, it can readily be understood that inflammation of any of the pelvic viscera can cause spasm of those muscles mentioned here thereby giving rise to the symptoms of coccygodynia.

At the Laird Memorial Hospital, Montgomery West Virginia, 20 of the last 23 cases observed were in females. Other writers have reported corresponding ratios.

The author states that the symptoms of coccygodynia are the result of an imbalance of the pelvic musculature. Pain may be referred to the coccyx, anorectum, pelvis, or the suprapubic, lumbar and perineal regions. Many combinations, and occasionally simply coccygeal pain, may obtain. The author attributes most of the cases of coccygodynia to inflammation of the pelvic organs in both men and women. Trauma and psychogenic factors account for a small percentage of cases. It is more likely that nervous is a result, rather than a cause of coccygodynia.

The diagnosis may be suspected in any patient complaining of rectal or coccygeal pain, or any combination of the previously mentioned symptoms. The most common physical finding is a spasm of one or more of the muscles of the pelvic floor. The affected muscles have a swollen, beefy feel to the examining finger on rectal examination. Spasm of any of the subject muscles can cause the pain due to muscle imbalance. If there is severe unilateral spasm, the stool may take on a triangular shape. In prolonged, untreated cases the affected muscle will become small and feel not unlike bands of banjo strings. The examination by pressure on the affected muscle may elicit pain duplicating the patient's complaints. Local and remote foci of infection should be sought and corrected. X-rays contribute nothing to the diagnosis.

The author believes that the treatment of coccygodynia is entirely nonsurgical. There is no indication for excision of the coccyx for coccygodynia per se. The treatment is massage. This is accomplished as for a rectal examination, and the finger massages the muscle in the direction of the fibers, which causes rather severe pain at first, so gentle massage, followed by increasing pressure as the pain diminishes, is the method of choice. Too vigorous massage may cause hemorrhage into the muscles. Three treatments per week of about 2 to 3 minutes each give the best results. The number of treatments is dictated by the progress of the patient. The average number in the present series was 15.

Other aids in treatment include a sitting posture to avoid pressure on the coccyx, heat, and especially relief of constipation.

Follow-up in 8 of the last 23 patients operated upon for excision of the coccyx indicates that only 2 obtained relief. The last 22 patients were treated by massage, and 8 were relieved. Two of the 22 were advanced cases, having gone to the banjo string stage.

KENNETH H. SPOONER, M.D.

Lacroix, P.: Stimulation of the Longitudinal Growth in the Tibia by Elevation of the Diaphyseal Periosteum (Excitation de la croissance en longueur du tibia par décollement de son périoste diaphysaire) *Rev. orthop.*, Par 1947 33 3

Partial operative arrest of growth of the longer extremity for equalization of length of both extremities has been successfully used in children for some time. Many workers devised numerous procedures such as insertion of foreign bodies near the epiphyseal plate, or curettage of the marrow cavity through a window to excite increased growth in a long bone of the shorter extremity but all these attempts failed.

The author stripped the entire periosteum of the tibia in 10 rabbits. An increase of growth was observed from 0.5 to 4.5 cm. within from 20 days to 5 months. A similar observation was made by Ollier in the year 1867. However it is suggested that a great deal of further investigation is necessary before much significance can be attributed to these experiments.

It is believed that an increased blood supply alone cannot be responsible for the increased growth because lumbar sympathectomy did not cause an

increase of growth in young individuals although it caused an increased blood supply to the lower extremities.

The author suggests that venous stasis exerts a definite stimulating influence on osteogenesis. Ligation of the large veins in the extremities accelerates callus formation (Pears and Morton, McMaster, Roome). The increase of reparative osteogenesis would however not explain the increase in length of the long bones. Bergman and Kishikawa stated that venous stasis has no definite influence on the epiphyseal plate.

The author has recently demonstrated that there are organic substances which act on the enchondral ossification of the epiphysis. It is possible that by stripping of the periosteum an increased amount of this substance is liberated. It is further assumed by the author that the osteogenic powers of the periosteum are stimulated by the same substances that act on the epiphyseal plate. This hypothesis might also help explain the increased longitudinal growth of bones in which the diaphysis had been the site of fractures or had been used as a donor site for a bone graft (Compere and Adams, 1937).

GEORGE L. REES, M.D.

SURGERY OF THE BLOOD AND LYMPH SYSTEMS

BLOOD VESSELS

Massell, T. B.: The Fluorescein Wheel Test for Collateral Circulation in the Preoperative Evaluation of Patients with Aneurysms and Arteriovenous Fistulas. *Surgery* 1947 3 616.

Operative cure of an arteriovenous fistula of a major artery frequently necessitates quadruple ligation of the component arteries and veins. In order to avoid gangrene, it is necessary to be sure that the collateral circulation is adequate prior to the operation. Clinical observation of evidence of a large fistula and accurate localization of the lesion in relation to the collateral arteries give some clue to the state of the collateral blood supply but a more definite test is necessary.

The Matas-Moskowitz flushing time gave variable results with different observers. The Matas compressor would slip as the position of the extremity was changed so that blood flowed through a supposedly occluded artery.

A new method for testing the collateral circulation which was based on the use of wheal fluorescence was devised. The aneurysm is occluded by a Matas compressor. A series of parallel scratches is made less than 8 cm. apart both on the involved and on the opposite extremity. Ten cubic centimeters of 10 per cent fluorescein are injected into an arm vein and the level of wheal fluorescence is examined by filtered ultraviolet light. If the collateral circulation is adequate, the lowest level of fluorescence should not be more than 8 cm. higher on the involved extremity than on the normal side.

Twenty-eight patients with aneurysms or arteriovenous fistulas were examined before operation by this technique and by the Matas-Moskowitz test. Wheal fluorescence seems to have the following advantages over the flushing time test for the collateral circulation.

1. Wheal fluorescence provides a clear and definite end point which is not subject to individual variation depending on the person who performs the test.

2. There is no arbitrary time limit. The criterion of normal value is provided in the opposite extremity in each observation.

3. Since the extremity does not have to be moved during the test, there is less danger of error from slipping of the compressor.

4. The fluorescein wheal test requires a briefer period of arterial compression than the flushing time technique and is therefore less painful to a hyper-sensitive patient.

Certain defects common to both tests were pointed out by the author. The improvement in the collateral circulation following sympathectomy was measured with both of the tests.

THOMAS B. MASSELL, M.D.

Rector, E. W.: Evaluation of the Basal Vascular Tone Test as an Indication for Sympathectomy in the Treatment of Surgical Lesions of the Major Arteries. *Surgery* 1947 630.

The development of the collateral circulation after ligation of a major artery may often be aided by sympathectomy performed previous to or at the same time as the arterial ligation. The benefits of sympathectomy are most marked in the patients in whom the vasomotor tone is increased.

Following the technique of Nalide and Sayen, measurements of the skin temperature were made with the aid of a galvanometer in a constant temperature room at 20°C and 40 per cent humidity. The digital skin temperature was measured at the start of the test and every 10 minutes thereafter. The values of the skin temperature readings obtained 30 minutes after the patient was admitted to the constant temperature room served as a final reading.

The clinical evidences of increased vasomotor tone were also observed, i.e., cyanosis, sweating, and constricted veins. The results of the test were compared with the clinical impression in 45 patients. There was agreement in 39 cases. In 10 of the 15 cases in which there was disagreement it was possible by analysis of the end results to compare the value of the two methods. Clinical judgment was found to be superior to evaluation by the basal vascular tone test in 8 of the cases while in only 2 cases the test for basal vascular tone proved to be superior to clinical appraisal of the patients.

The author points out that his patients were vigorous young individuals, all of whom had sustained local trauma to the blood vessels. The original work of Nalide and Sayen was based on an older group of individuals with arterial occlusions of more gradual onset.

In order to explain the discrepancy between the two reports it is suggested that abnormal vasoconstriction may be induced by local trauma and that this segmental arterial spasm may be quite independent of the general vasomotor tone.

THOMAS B. MASSELL, M.D.

BLOOD TRANSFUSION

Swedberg, Birger; Windström, Gösta; and Allin, Knut: The Importance of Aseptic Technique and the Fallaciousness of Chemical Bacteriostatics in Blood Banking and Plasma Preservation. *Acta med. scand.* 1947 17 480.

The authors describe the work done elsewhere on bacteriostasis in blood preservation. In connection with the production of plasma for military use in Sweden during the period from 1943 to 1944 a very open method of blood drawing and plasma separation was used with the great possibility of consequent bacterial contamination. By the addi-

MISCELLANEOUS

Cartwright G. E.: Dietary Factors Concerned in Erythropoiesis. *Blood* 1947 2 111 256

Knowledge concerning the production of the red cells is not nearly as complete as that concerning their destruction. Although hemin has been synthesized in vitro by Fischer and Zelle there is little evidence to indicate that such steps take place in vivo. It is the purpose of this review to describe those dietary factors now recognized as necessary for erythropoiesis and to discuss the present knowledge concerning them.

The known factors concerned in the formation of the red cell may be divided into three groups vitamins amino acids and minerals. Because of our lack of knowledge, it will be necessary to consider the formation of the erythrocyte and hemoglobin as one process erythropoiesis.

VITAMINS

Riboflavin, nicotinic acid, pyridoxine, and the various folic acids are important for red cell formation in at least one species each.

A The role of riboflavin in blood regeneration in dogs on a purified ration has been studied by Spector, Maas, Michaud, Elvehjem, and Hart, and they concluded that it plays a role in determining the size of new red cells. Wintrobe, Buschke, Folin, and Humphreys found the development of anemia in a riboflavin-deficient pig which survived a long time. A moderate impairment in the rate of red cell and hemoglobin regeneration in the rat as a result of riboflavin deficiency has been demonstrated. Unmistakable anemia has been reported in monkeys. Upon administration of riboflavin there is a definite increase in the hemoglobin, red cell and white cell counts in the blood. There is no true evidence that riboflavin deficiency in man results in anemia. Myelin degeneration of the peripheral nerves and posterior columns of the spinal cord occurs in riboflavin-deficient dogs. It was thought that this vitamin might play a role in the etiology of subacute combined degeneration of the cord. That riboflavin is not the extrinsic factor has been conclusively demonstrated. Klein and Kohn have shown that the synthesis of flavinadenine dinucleotide from riboflavin takes place in human blood cells both in vitro and in vivo. It seems possible that this enzyme may be related to erythropoiesis or hemoglobin synthesis. It is known that vitamins the flavinadenine nucleotide and Spector *et al* have suggested that this vitamin may be concerned in the metabolism and arrangement of the amino acids of globin.

B Nicotinic acid. Handler and Featherston demonstrated that the parenteral administration of physiological saline solution to dogs with acute black tongue resulted in alleviation of the existing hemolysis and was associated with the appearance of severe anemia. This responded immediately to the administration of nicotinic acid or nicotina

tion of sulfathiazole 100 mgm./100 c.c. and rapid cooling of the blood and with plasma preparation within 5 days it was believed that bacterial growth in the blood might be prevented. The plasma was sterilized by filtration immediately before drying and stored when ready at between -15 and -25°C and The clinical results with this plasma were generally good. However plasma which was undried showed almost constantly bacterial and fungoid growth after from 12 to 18 months. When contaminating organisms are found they are generally resistant to sulfathiazole even in concentrations of 500 mgm./100 c.c. The authors re-emphasize the importance of aseptic methods from the moment of blood collection to the dispensation of the finished plasma. No bacteriostatic agent can take the place of aseptic technique.

EDWARD H. CAMP, M.D.

Muirhead, E. E., Small, A. B., and McBride, R. B.: Peritoneal Irrigation for Uremia following Incompatible Blood Transfusion. Report of a Case. *Arch. Surg.* 1947 54 374.

The authors report a case of uremia following incompatible blood transfusion which was successfully treated by peritoneal irrigation. The method used by Frank, Seligman and Fine in acute renal failure following sulfathiazole therapy was utilized.

Through a clerical error a white female patient aged 36 received an incompatible blood transfusion. For 16 days following and prior to the institution of peritoneal irrigation, the patient's condition gradually deteriorated, the azotemia became progressively worse, and the signs and symptoms of grave uremia was not expected to survive.

Peritoneal irrigation with a sump aspiration drain in the right lower quadrant and a No. 18 rubber French catheter in the left upper quadrant was then employed for 6 days. The solutions used were several of the crystalloid types containing heparin and penicillin. Substantial amounts of urea were obtained by this extrarenal route, and the azotemia was promptly and greatly relieved. Subsequently the kidneys cleared large quantities of urea from the body but polyuria was necessary as the urea clearance remained depressed.

Overhydration constituted one of the main complications as the kidneys were unable to rid the body of water. This condition was apparently aggravated by the use of Tyrode's solution and an isotonic solution of three chlorides in the peritoneum. Recovery was associated with the loss of water and salt from the body while dextrose in distilled water was used for peritoneal irrigation.

A low grade peritonitis was controlled by parenteral and intraperitoneal streptomycin. Circulatory failure associated with oliguria was successfully treated by the intravenous administration of blood plasma and electrolytes. The patient left the hospital 38 days after the reaction and her urea clearance at the time of discharge was 33 per cent of normal.

EDWARD F. LEWIS, M.D.

mide. Histological examination of the tissues of a dog was made and revealed hemosiderosis of the spleen. Erythropoiesis appeared to have stopped at the erythroblast level. These authors postulated that since immature nucleated erythrocytes require they probably use pyridine nucleotides in this respiration. As the supply of nicotinic acid diminishes, anemia develops because of the lack of coenzyme in the earliest stages of cell development. Nutritional pancytopenia in rats has been reported as being prevented by nicotinic acid. The association of anemia with pellagra has long been known. This has been reported as varying in from 44 to 84 per cent of the cases. There is no evidence that the anemia associated with pellagra is due to nicotinic acid deficiency. Proof that such an anemia exists in man is lacking. Gastric achlorhydria occurs in approximately 80 per cent of the patients with pellagra.

C. Pyridoxine. The development of severe anemia has been adequately demonstrated to result from pyridoxine deficiency in dogs and swine. A mild anemia develops in pyridoxine-deficient chicks and in this species, the anemia is accompanied by a decreased clotting time, hyperprothrombinemia, and small spleens. Morphologically, the anemia in dogs and swine is microcytic and slightly hypochromic. It is severe in both species and develops in other species within a month. The bone marrow in pyridoxine-deficient swine is hyperplastic. Following therapy with crystalline pyridoxine the marrow becomes normoblastic. Hemosiderosis of the spleen, liver and bone marrow has been reported in swine. Following therapy the hemosiderosis of the liver and bone marrow disappears and that in the splenic pulp diminishes. Ataxia and convulsions have been reported in both dogs and swine and pathologically the nervous system shows interesting changes. Degeneration takes place in the peripheral nerves, spinal ganglia, posterior roots, and the dorsal funiculi of the spinal cord. It would seem that pyridoxine like the antipernicious anemia substance and copper is essential to the integrity of both the nervous and hematopoietic systems. There is no evidence for the presence of a hemolytic element in pyridoxine-deficiency anemia. Elevated plasma iron levels in dogs were reported by Fouts *et al.* The serum iron increase has been studied in detail in swine and begins at about the fourth week of deficiency. Combined iron and pyridoxine deficiency results in an abnormally low serum iron level and in this combined deficiency hemosiderosis of the tissues is prevented. It would seem that the ferremia of pyridoxine deficiency is caused by continued retention of iron at a time when its utilization for hemoglobin synthesis is at a minimum. The possibility exists that the absorption of iron is increased in pyridoxine deficiency. Ninety-five per cent of the increased iron in the serum is in a nondialyzable, ferric state. Copper, unlike iron, is not mobilized in the blood of the severely anemic animal. There is no evidence to date that pyridoxine is directly concerned with the synthesis or metabolism of the porphyrins.

It has been shown that a relationship exists between pyridoxine and tryptophan metabolism. Since a deficiency of either pyridoxine or tryptophan gives rise to anemia, the question arises as to whether the two substances combine to form a third which is essential to blood formation. This is not the case. In swine, combined pyridoxine and iron deficiency results in a greater anemia than does either deficiency alone.

Pyridoxine has never been conclusively demonstrated to be essential to human nutrition. Pyridoxine-deficiency anemia resembles pernicious anemia in several respects. In both conditions there is an increase in serum iron, hemosiderosis of the tissues, hyperplastic bone marrow and neurological lesions. That they are not the same is evidenced by a microcytosis in one and a macrocytosis in the other.

D. Lactobacillus casei factors. The various new factors described as having growth activity for the *Lactobacillus casei* and related organisms are many. Recently considerable clinical interest has developed in this group of substances because of the demonstration of the effectiveness of the synthetic *Lactobacillus casei* factor in various macrocytic anemias in relapse.

The value of folic acid (pteroylglutamic acid) in various types of macrocytic anemia in relapse has now been adequately demonstrated and repeatedly confirmed. Spies *et al.* observed a reticulocyte response and an increase in the red cell count in patients with macrocytic anemia in relapse. The drug was given orally to 4 patients in a dose of from 100 to 150 mgm. daily and parenterally to 5 patients in a dose of from 20 to 50 mgm. Moore, Bierbaum, Welch and Wright noted clinical and hematologic remissions in 3 patients with Addisonian pernicious anemia following the daily oral administration for 10 days of 30 mgm. and 100 mgm. of the synthetic material respectively. The response was excellent. Observations on the effectiveness of synthetic folic acid in the treatment of Addisonian pernicious anemia have now been confirmed many times. A daily dose of from 5 to 10 mgm., either orally or parenterally will often produce a maximal response. Synthetic folic acid has been found to be effective in alleviating the hematologic as well as many of the other manifestations of sprue. The administration of from 15 to 200 mgm. daily is followed by a reticulocytosis and rise in the leucocytes, platelets, red count, hemoglobin, and volume of packed red cells to normal. The glossitis disappears in 3 or 4 days, after which there is rapid regeneration of the papillae. There is an improved sense of well being, an improvement in appetite, and a decided gain in body weight. Synthetic folic acid has been found to be effective in the treatment of nontropical nutritional macrocytic anemia of infancy with megaloblastic bone marrow macrocytic anemia of pregnancy macrocytic anemia associated with alcoholic cirrhosis of the liver and macrocytic anemia associated with carcinoma of the stomach. No response to folic acid has been observed in cases of aplastic anemia, leukemia, or iron deficiency anemia. Folic acid has not been of value in

correcting the leucopenia of influenza, or the pan hematopenia of myelophthisic and idiopathic states. It does not prevent the development of agranulocytosis in a patient receiving thiouracil.

Spies and coworkers have administered large doses (from 4 to 12 gm.) of thymine to 10 patients with Addisonian pernicious anemia. The clinical and hematological improvement was found to be similar to that which follows the administration of folic acid to such patients. The authors speculate that perhaps folic acid acts as an enzyme or coenzyme in the synthesis of thymine or a thymine-like compound. This naturally leads to questions as to the identity of the extrinsic factor, the intrinsic factor, and the anti-pernicious anemia substance in liver as postulated by Castle. It can be stated that the folic acid is probably not the extrinsic factor alone since it acts orally in the absence of normal human gastric juice and is effective parenterally.

E. Extrinsic factors. It has now been 17 years since Castle first presented evidence concerning a dietary factor which when incubated with a factor in normal human gastric juice formed a substance effective in the treatment of pernicious anemia. Beef muscle, yeast, wheat germ, milk purified casein, liver eggs and rice polishings have been shown to contain significant amounts of the factor. The active factor can be removed from beef muscles by repeated extractions with dilute acetic acid or by extraction with from 70 to 80 per cent alcohol. It is water soluble, thermostable, resistant to alkalization, readily soluble in from 70 to 80 per cent alcohol but is rapidly destroyed in 95 per cent alcohol. The active substance is ultrafiltrable and cannot be extracted from an 80 per cent alcoholic solution with ether. Following saturation of an alcoholic extract of beef muscle with ammonium sulfate the activity is found in the precipitate. The existence of an anemia due to a deficiency of Castle's extrinsic factor has been clearly demonstrated by Moore, Vilter, Minnich and Spies. These workers have described the occurrence of macrocytic anemia in 56 patients who had existed for years on diets inadequate in animal protein and in the vitamin B complex. Most of the subjects had at one time shown clinical evidence of pellagra, riboflavinosis or beriberi. The most striking clinical manifestations were weakness, pallor, glossitis, skin changes, and intermittent or persistent diarrhea. The anemia was cytologically indistinguishable from true Addisonian pernicious anemia, and the bone marrow was the same in the two conditions. Following the administration of an 80 per cent alcoholic extract of beef muscle a reticulocytosis developed and after prolonged administration the erythrocytes increased in number. All of the patients responded promptly to the parenteral injection of highly purified liver extracts. Studies on the pathogenesis of the anemia indicated that it was probably caused by a dietary deficiency of extrinsic factor associated in many but not all, instances with poor absorption from the intestinal tract. The anemia, leucopenia and thrombocytopenia all respond rapidly to pteroyl

glutamic (folic) acid therapy. The occurrence of macrocytic anemia of nutritional origin in India has been reported.

F. Ascorbic acid. It has been conclusively shown that the scorbutic state in guinea pigs as well as in human beings is frequently accompanied by anemia. The nature of this is in dispute.

This has been demonstrated in guinea pigs and the addition of ascorbic acid to a scorbutogenic diet prevents the development of the anemia.

The frequent occurrence of anemia in human scurvy has been reported by many authors. The red cells have been reported as being macrocytic, normocytic, and microcytic or hypochromic. The exact causal relationship still remains to be established and the literature is confusing.

AMINO ACIDS

Because of the difficulty in preparing a diet deficient in a single amino acid only a few experiments of such a nature have been conducted. These included deficiencies of tryptophan, lysine and phenylalanine.

Rats fed a diet abnormally low in protein but adequate in all other respects develop anemia which responds to protein therapy.

The minimal molecular weight of hemoglobin has been shown to be about 16,700 and studies of the osmotic pressure and of the sedimentation constant have shown that the true molecular weight of anhydrous hemoglobin is close to 66,600 which indicates that hemoglobin is composed of four globin units.

No single amino acid appears to be more important than the others in hemoglobin synthesis.

For some time it has been known that tryptophan accelerates recovery and causes a prompt reduction in the reticulocytosis seen in anemia caused by phenylhydrazine. By acid hydrolysis of casein it has been possible to prepare a protein which is almost totally deficient in tryptophan. By this means the anemias as a consequence of deficiency have been studied. The results have not been conclusive.

Since a lack of either tryptophan or of pyridoxine leads to the development of anemia and since there is a disturbance of tryptophan metabolism in pyridoxine deficiency the question arises whether pyridoxine anemia may be due to a lack of properly metabolized tryptophan. If this were true the two anemias should be similar but they are quite different. It is known that deamination of casein destroys the entire content of lysine, about half of the histidine and a portion of the tyrosine. Hogan and Ritcho reported that rats maintained on deaminated casein develop anemia and splenomegaly. When casein was added to the deaminated casein ration the anemia failed to develop.

MINERALS

Iron. That iron is a constituent of the hemoglobin molecule and that a deficiency of iron gives rise to an anemia are both well established.

1. Availability. Dietary iron is of two types, organic and inorganic. The organic iron is present

principally in the form of iron porphyrin compounds. The ability of inorganic iron salts to cure iron deficiency anemia has been well demonstrated in many different species. On the other hand it has been shown that organically bound iron is very poorly utilized when given orally. Organic iron if it is to become available, must be converted to an ionizable form. In the case of hematin it has been shown that less than 25 per cent has been utilized and this utilization appears to be dependent upon the amount of decomposition by intestinal bacteria. It would seem that the body's need for iron can be entirely satisfied by inorganic iron compounds.

2. Absorption. Iron is absorbed chiefly in the duodenum but the stomach and the whole of the small intestine may take part under certain circumstances. It is doubtful if this occurs in the colon. It is absorbed by the tips of the villi of parts of the duodenum and from there is passed into the portal circulation and is carried to the liver.

a. Type of iron. It is generally believed that iron is absorbed in the soluble, ionizable, ultrafiltrable, ferrous form. The absorption of ferric compounds is generally less than that of ferrous compounds and is dependent on the capacity of the intestinal contents to reduce them. Organically bound iron is very poorly absorbed. Using the radioisotope iron technique, it has been demonstrated in two different laboratories that human subjects absorb ferrous iron more efficiently than ferric iron. There is a species difference, however, and this may account for the disagreement between clinical and animal investigations.

b. Amount of iron. The height of the serum iron increase is directly proportional to the amount given up to that point at which intestinal utilization is great enough to interfere materially with intestinal motility.

c. Gastric acidity. The free gastric hydrochloric acid performs two functions: (1) reducing, ionizing, and dissolving the iron and (2) delaying the formation of insoluble and undissociated iron compounds which may occur above pH 5. For these reasons any factors which cause increased alkalinity diminish iron absorption.

d. Conditions in the duodenum. The pH of the duodenal contents likewise affects the ionization and solubility of the iron compounds. The presence of certain reducing substances in the diet aids the absorption of iron. Liver extract is such a substance. The reducing properties of ascorbic acid are well known.

e. Calcium/potassium ratio and vitamin D. There is ample evidence that excess calcium in the diet inhibits iron assimilation and causes a mild anemia. Furthermore all investigators are agreed that iron utilization is affected by the calcium/potassium ratio in the diet but there is disagreement as to whether a high or low ratio is favorable.

f. Selective absorption. There is considerable disagreement concerning this factor.

g. Other factors. There is suggestive evidence that pyridoxine may regulate iron absorption.

3. Transportation. There is now ample experimental evidence that there is a fraction of iron in the plasma which is in a nonhemoglobinous form. The significant fact concerning plasma iron is that it has been demonstrated to function as transport iron. It is interesting that transportation and utilization are very rapid processes. The normal range for plasma iron in human beings has been shown to be about from 0.050 to 0.180 mgm. per cent. The plasma iron level is affected by the rate of absorption of iron, the balance between that going to and from the tissues, and the equilibrium between the amount used for hemoglobin formation and that coming from hemoglobin catabolism. In general, in iron deficiency states it is uniformly low. Under conditions of decreased red cell formation, it tends to be high. When the bone marrow is unusually active the plasma iron is low. In hemolytic states the plasma iron level is dependent upon the equilibrium between the iron released by hemolysis of red cells and the rate of uptake by the bone marrow.

Barhan has described a third form of blood iron, constituting 5 to 10 per cent of the total blood iron, which he termed the "leicht abspaltbare Blutisen" fraction. This was so named because it was easily freed from its lightly bound state in the erythrocytes and plasma by acidification with weak acids.

4. Storage of iron. Although the literature on this phase of iron metabolism is very extensive the storage of iron is poorly understood. The immobile fraction of body iron is made up of parenchymal iron and the iron in myohemoglobin. This constitutes about 25 per cent of the total body iron. Parenchymal iron is probably held tightly by the cells in such forms as cytochrome, catalase, peroxidase, and other cellular enzymes and is essential to the life of these cells. Myoglobin has been shown to be very similar to hemoglobin in respect to the absorption iron content, and elimination by way of bile pigments, but may be differentiated by means of a specific precipitation reaction.

In the dog, Whipple and his coworkers concluded that the liver, spleen, and bone marrow are the principal sites of storage iron. Fifty to 70 per cent of the iron injected intravenously can be shown to be stored in the liver and spleen. The liver contains the main bulk of the iron stored and is considered the most important organ in the conservation and utilization of iron in the body. The turnover in the liver is exceedingly rapid if there is a demand for the element for blood formation. However the spleen contains the highest reserve stores of iron per 100 gm. of fresh tissue. The iron content of the rib bone marrow runs parallel with that of the spleen.

Little is known concerning the chemical nature of the stored iron. Approximately 60 per cent of the iron in thoroughly perfused liver is in protein combination, in so far as it is removable from solution by precipitation with trichloroacetic acid. It has been shown that 43 to 60 per cent of the iron in perfused adult rat liver reacts directly with bipyridine in the presence of a reducing agent and must, therefore, be

PRELIMINARY PROGRAM—1947 CLINICAL CONGRESS

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OTORHINOLARYNGOLOGY

The program in otorhinolaryngology will consist of two evening symposia, three morning panel discussions from 10-15 to 12-15, and an evening session on Wednesday in which a combined program with the ophthalmologists will be held. The fact that the morning panel discussions are planned this year to follow those on ophthalmology instead of being held simultaneously, will enable surgeons who combine these specialties in their practice to attend both sessions.

The subjects for the evening symposia will be Tuesday—Bronchiectasis Thursday—"Surgical Management of Carcinoma of the Larynx."

The subjects for the Wednesday evening combined session are listed in the preceding section on ophthalmology.

Tentative subjects for the panel discussions are as follows: Repair of Bilateral Adductor Paralysis of the Vocal Cords, Anesthesia for Ear, Nose and Throat Surgery and Rhinoplasty.

FORUM ON FUNDAMENTAL SURGICAL PROBLEMS

The Forum on Fundamental Surgical Problems will be conducted on Tuesday, Wednesday, Thursday and Friday mornings. The Forum affords a large surgical audience the opportunity to become acquainted with the work of many productive clinical and experimental investigators through the medium of the concise presentation at the same time. It gives a number of young, well-trained surgeons their first opportunity of a hearing before a national surgical organization. It is the professed purpose of the Surgical Forum as expressed by Dr. Owen H. Wangenstein, Chairman of the Forum Committee to attempt to bring before its assembly each year the best that is new in surgery, announcement of new found knowledge of special interest to surgeons and wider dissemination of new significant information in the interphases between surgery and allied medical specialties suggests the objectives which the sponsors have in mind in the formulation of programs for presentation.

Selection of papers for the New York Clinical Congress is now being made by the committee, which is guided by originality of thought and interest suggested in the abstract submitted by the author. Each speaker is allowed 10 minutes for his presentation.

A total of 93 talks were given at the Surgical Forums in Cleveland.

SPECIAL SYMPOSIA

A symposium on fractures and other traumas will be held on Tuesday afternoon, a symposium

on cancer on Wednesday afternoon and a symposium on graduate training in surgery on Thursday afternoon.

SPECIALTY PANEL DISCUSSIONS

Panel discussions on the surgical specialties will be held on Friday afternoon hours and programs to be announced later. The panels will be held concurrently in the following fields: orthopedic surgery, neurosurgery, plastic surgery, obstetrics and gynecology, urology and thoracic surgery.

HOSPITAL STANDARDIZATION CONFERENCE

The first formal session of the Clinical Congress will be the opening meeting of the twenty-sixth Hospital Standardization Conference. Dr. Irvin Abell of Louisville, President of the College will preside. The hospital conferences will continue on Monday afternoon with sessions following on Tuesday, Wednesday and Thursday mornings afternoons and evenings.

Hospital administrators, members of governing boards, heads of the various hospital departments and their personnel, nursing groups, and many other persons directly or indirectly concerned about hospital progress will be interested in the discussion of current hospital problems. National organizations representing various groups of hospital personnel will co-operate and participate in the meetings which will include formal sessions, panel discussions, round table conferences, and open forums.

MEDICAL MOTION PICTURES

The latest available films showing surgical procedures and related subjects will be shown in the medical motion picture exhibits which will be held daily. These are a much appreciated feature of the Clinical Congress.

Both sound and silent standard and color films will be shown, all of which have been approved by the Committee on Medical Motion Pictures.

TECHNICAL AND SCIENTIFIC EXHIBITION

The technical exhibit, together with the registration and clinic ticket bureaus, will be located in the Basildon Room, Jade Room, and Astor Gallery all on the third floor of the hotel. Leading manufacturers of surgical instruments, lead apparatus, sterilizers, operating room lights, ligatures, dressings, hospital apparatus and supplies of all kinds, and pharmaceuticals and publishers of medical books will be represented in the exhibition. The technical exhibits will demonstrate many of the new features learned from our experience in the war.

in some form of chemical combination other than that of the iron in hematin. About 60 per cent of this non-hematin fraction appears in the trichloroacetic acid precipitate. The total iron in a trichloroacetic acid filtrate reacts directly with potassium cyanate in acid solution after oxidation with hydrogen peroxide and this fraction accounts for about 40 per cent of the nonhematin iron. About 50 per cent of the total iron in the trichloroacetic acid filtrate is precipitated along the organic substances by normal lead acetate. The digestion of fetal calves' livers, adult rats' livers and muscle tissue, and beef spleen by pepsin at about pHs produces a five fold increase in the iron content of the trichloroacetic acid filtrate.

There is an appalling lack of knowledge concerning hemosiderin. It is recognized that it is the iron-containing portion of hemoglobin which rests in the cells of most tissues but especially is it found in the spleen, liver and kidney following the destruction of erythrocytes. Hemosiderin probably represents some stage or side reaction in the disintegration of hemoglobin into bile pigment but the exact nature of the reactions involved is not understood. There is little doubt that it functions as storage iron for the granules are abundant following repeated injections of ferric chloride and disappear when the demands of the body for iron are great.

5. Anemia of iron deficiency. The anemia of iron deficiency and its response to iron are well recognized. A hypochromic, microcytic anemia is characteristic of iron deficiency and has been described in different species. In the advanced stages marked anisocytosis and poikilocytosis of the red cells are present. The Price-Jones curves in severe cases show a marked shift to the left with a broad base. In the absence of iron, hemoglobin cannot be synthesized and there is a maturation arrest at the normoblastic stage. The bone marrow is hyperplastic and shows a predominance of the more mature nucleated red blood cells principally the polychromatic normoblasts. There is no evidence that there is an increased rate of destruction of red cells. Porphyrin metabolism has been inadequately studied in iron deficiency. The normal erythrocyte protoporphyrin ranged between 20 and 45 gamma per 100 c.c. of erythrocytes. It has been demonstrated that the serum iron level is low in iron deficiency anemias of varied etiology.

6. Excretion. It has long been claimed that iron is excreted by three routes: urine, bile, and the large intestine. It is now agreed that only a minimal amount of iron is excreted in the urine. It has been shown that the urinary excretion of iron is rather constant in the same individual and that it is not related to iron intake. There is evidence that significant amounts of iron are eliminated in the bile under certain circumstances. Under conditions of increased blood destruction the elimination of biliary iron may increase tenfold and parallels the increased output of bile pigment, but even then only 3 per cent of the released iron is eliminated in the bile. It would seem that the body controls the iron stores by controlling the absorption rather than its elimination and that

once iron gains entrance into the body it remains there.

B. Copper. It has now been demonstrated many times in several different species that copper is needed in addition to iron in order either to prevent or to cure the anemia.

In the treatment of nutritional anemia in infants it has often been demonstrated that when iron therapy is combined with copper therapy the rate of hemoglobin formation is more rapid than when the anemia is treated with iron alone. The livers of anemic infants have revealed a lower copper content than the livers of nonanemic controls. There is little evidence to indicate that iron alone is as effective as combined iron and copper therapy in infants.

The value of copper in the treatment of hypochromic microcytic anemia in adults is controversial. In general, the consensus of most hematologists is that the adult patients with hypochromic microcytic anemia in the absence of infections, malignancy and continued hemorrhage will respond satisfactorily and rapidly to iron medication. In nutritional anemia in infants the rate of hemoglobin formation is accelerated when copper is given in addition to iron. In adults supplemental copper therapy may be of value in a few cases. Most cases will respond if adequate doses of iron are given.

The absorption and excretion of copper in man has been little studied. The daily requirement of copper for adults is from 1 to 2.5 mgm. It has been estimated that the adult body contains between 100 and 150 mgm of copper. During embryonic life copper becomes concentrated in the liver and reaches a maximum concentration at term. There is then a sharp decline after the second month. The copper content of the liver has been noted to be increased in Mediterranean anemia, hemochromatosis, cirrhosis of the liver, acute yellow atrophy of the liver, tuberculosis and carcinoma. It is now agreed that the range for whole blood copper in normal adult males is approximately from 90 to 150 micrograms per cent, while that for normal adult females is approximately from 100 to 160 micrograms per cent. Copper is distributed approximately equally between the cells and the serum.

Many investigators have reported the presence of increased blood copper during pregnancy. Sachs and his group have made studies on whole blood copper as well as iron at various ages. In all the conditions studied there has been an inverse relationship between the copper and iron content. As the iron falls the copper content tends to rise. Hypercupremia is the usual response to hypoferrremia.

Elevated serum copper values have been reported in pregnancy and in infections accompanied by anemia. In both of these conditions there is a low serum iron. The serum copper content is subject to diurnal variations but is not affected by menstruation.

7. The function of copper. The precise manner in which copper is related to the formation of red cells is not understood. It is not a constituent of the hemoglobin molecule. Since the administration of

copper to anemic rats is followed by a rise in the erythrocyte count without a rise in hemoglobin. It has been postulated that copper is essential for stroma formation of the cell or for the release of erythrocytes from the bone marrow rather than for hemoglobino-genesis. When iron is fed to iron and copper deficient animals the total iron content of the liver and spleen increases in proportion to the amount of iron fed. Thus in the absence of copper iron is absorbed and stored normally. If copper is then fed to these animals in the place of iron hemoglobin formation takes place and the iron content of the liver and tissue is reduced to a level of that found in severely anemic animals. From this it has been concluded and accepted that copper is essential for the mobilization of iron from the tissues and for its conversion into hemoglobin or, stated in another manner, copper acts as a "catalyst" for the formation of inorganic iron into hemoglobin.

There are numerous other recognized functions of copper. It has been shown that copper is essential for the activity of at least 3 enzymes. The oxidation of crystalline glutathione is accelerated in the presence of small amounts of copper. The catalytic effect of copper on the oxidation of cysteine as well as ascorbic acid has been reported. Glycolysis is known to be activated by copper and accelerated in anemia.

C. Cobalt. The role of cobalt in erythropoiesis is unique. A deficiency results in anemia. The administration of small amounts to normal animals produces erythrocytosis, whereas the administration of large amounts depresses erythropoiesis. The enzootic occurrence of cobalt deficiency has been reported from several regions of the world. Anemia is present and is often severe. The anemia is either normocytic or microcytic and usually hypochromic. Blood smears reveal anisocytosis and polikilocytosis. There is a hypoplasia of erythropoietic tissue in the bone marrow, hemosiderosis of the tissues and a reduction in reticulocytes in the blood. An experimental anemia due to cobalt deficiency has not been produced in either rats or dogs. There is no substantial or convincing evidence that cobalt is needed by human beings for normal erythropoiesis. The administration of small amounts of cobalt to normal rats, dogs, guinea pigs, frogs, mice, rabbits, chickens, pigs, and ducks produces a marked polycythemia which is accompanied by a reticulocytosis, hyperplasia of the bone marrow and an increased erythropoietic activity in the spleen and liver. Larger doses of cobalt inhibit erythropoiesis. The metabolism of cobalt is unlike that of iron. The excretion of cobalt once it is absorbed is exceedingly rapid and is principally through the kidneys. LEROY J. KLEINBAUM, M.D.

SURGICAL TECHNIQUE

OPERATIVE SURGERY AND TECHNIQUE POSTOPERATIVE TREATMENT

Livingston, K. E.: Extremity Refrigeration without Tourniquet Ligation in Cases of Acute Arterial Deficit. *Ann. Surg.*, 1947 125 431

The author discusses the experimental studies carried out by Allen in 1918 and 1939, when he demonstrated that intact limbs can survive complete ischemia for significant periods if absolutely cooled. In 1941 these observations were applied clinically to amputation under tourniquet ligation and refrigeration. This method now has real value in preparing for and reducing the risk of amputation in the presence of advancing gangrene and toxic absorption or in cases of massive trauma to the limb. Limbs to be amputated by this method are ligated by tourniquet and cooled to levels of 2 to 8 degrees centigrade above freezing. Changes which are probably irreversible occur in the tissues. These are the combined result of cooling and of complete ischemia produced by the tourniquet. On the basis of present clinical experience, tourniquet ligation and refrigeration are appropriate only as preparation and cannot be safely employed when survival of the limb is anticipated. There is evidence clinically and experimentally that the more severe changes may be attributable to tourniquet ischemia rather than to cooling. The author believes it is therefore possible that refrigeration without tourniquet might be successfully employed in some cases of acute vascular deficit in which survival of the limb is anticipated.

The author cites a few clinical reports of refrigeration without tourniquet followed by amputation, but no pathological studies were made of the amputated extremities so no conclusions could be drawn. He cites one other case in which pathological studies were made and this revealed that the distal circulation of leg and foot was remarkably preserved. However the conclusions in this case were pessimistic.

The author then cites his own experience. Following an acute and severe vascular accident secondary to traumatic aneurysm of the popliteal artery cooling of the distal extremity was carried out for 28 days prior to amputation. During the interval of observation changes which were assumed by all observers to have been irreversible regressed and the appearance of the foot strikingly improved. Following amputation there was gross and microscopic evidence that revascularization was taking place in the cooled tissues and that the nutrition of the deep muscle tissues and weight-bearing skin and subcutaneous tissue of the foot had been well maintained. These studies did not indicate that the smaller circulation in the cooled areas had been extensively shut down by vasoconstriction due to

cold. The author was impressed by the wealth of small patent vessels in all tissues and also by the active recanalization processes in the thrombosed segments of major arteries.

It is believed that further clinical experience would be valuable in confirming or modifying these views and suggested that in the future more adequate cooling be used and that it be combined with alcohol block or lumbar sympathetic ganglionectomy because vasospasm may be a significant factor. G. ALLEN LIVA, M.D.

Shaffer, J. O.: A Method of Rapid Transfusion into the Femoral Vessels in Patients without Adequate Peripheral Superficial Veins. *Surgery* 1947 21 659

When rapid transfusion is required in a patient whose superficial veins are thrombosed or difficult to enter the author advocates that the femoral vessels be used. If the femoral artery has a good pulsation, the common femoral vein is usually patent and should be used. A 20 gauge needle $2\frac{1}{2}$ inches long with a short bevel is inserted just medial to the arterial pulsation and just below the inguinal ligament, perpendicular to the skin. As the needle is advanced to a depth of 2 to $3\frac{1}{2}$ cm. dark venous blood will appear in the syringe. Aspiration of 5 to 10 c.c. of blood resection and respiration insures that the needle point is well placed in the lumen of the vein. When a patient is in such profound shock that the pulsation of the femoral artery cannot be felt the femoral vein is usually collapsed and unsuitable for venipuncture. The artery should then be used, the puncture being made just distal to the inguinal ligament and at the midpoint between the anterior superior iliac spine and the pubic tubercle.

When the needle has been well placed it should be secured in position with three small Kelly forceps. These grasp the needle as close to the skin as possible each forceps being placed 120 away from the other two. The three forceps should then be taped firmly to the skin of the thigh and abdomen. In most instances it is also advisable to restrain the patient's leg.

Blood, plasma or fluids may be allowed to drip or may be forced into the vessel under pressure. When the infusion has been discontinued momentary pressure over the site of puncture is sufficient to prevent hematoma formation. B. F. LOOMIS, M.D.

Golnard, P., Ferrand, J. and Tardieu, P.: Post-operative Complications in Alcoholics (Sur ces ténues accidents post-opératoires graves des éthyliques). *Lyon chir.*, 1947 41 56

A group of characteristic complications occur in chronic alcoholic patients following operation. They usually begin about the first postoperative day and consist of fever, progressive agitation, delirium

tremens, and oliguria. In many instances death ensues. Eight cases are cited to illustrate the typical history of this syndrome in chronic alcoholics who underwent a gastrectomy for ulcer.

The authors have instituted a definite regimen to control and prevent this syndrome. Treatment consists of large doses of strychnine which are apparently well tolerated by these individuals. The dosage varies from 15 to 36 mgm. daily according to the clinical response and the severity of the disease, it is given every 2 hours and usually continued for 3 days sometimes 5 or 6. In addition betulin, liver extract and intravenous fluids are given. Sedation, in general to control the agitation has proved unsatisfactory although of the common hypnotics used, chloral hydrate seemed best.

This particular group of postoperative complication can be avoided by proper preoperative management. One week of complete preoperative rest with complete alcoholic abstinence, and a high carbohydrate consumption are recommended. Strychnine is given in daily doses of from 6 to 18 mgm. for 5 to 7 days accompanied by betulin, hepatic extracts and small doses of insulin.

Certain precautions should be taken during operation. Because of the unstable circulatory system in chronic alcoholics, the use of general anesthesia and administration of intravenous fluids are hazardous. Postoperative treatment is based on establishing a proper fluid balance and giving large doses of strychnine. Vitamin K should be used if any tendency toward bleeding is present. The authors suggest hepatic insufficiency as the basis for this syndrome.

C. F. FARRAR, KETTER, M.D.

ANTISEPTIC SURGERY; TREATMENT OF WOUNDS AND INFECTIONS

Vaughan, J., Thomson, M., and Dyson, M.: The Blood Picture and Plasma Protein Level following Injury. *J. Path. Bact. Lond.* 1946, 5A 749.

The authors describe their observations on the blood picture, serum bilirubin, plasma proteins, and urinary urobilin in a series of 14 patients following various types of injury. These were divided into three groups: (1) injuries other than those due to enemy action; (2) industrial injuries in which superficial burns were associated with fractures, and (3) injuries due to enemy action.

The findings irrespective of the character of the injuries, revealed the following:

During the first week there was a fall in the hemoglobin and red cells, and either a fall to the plasma proteins or an initial low level. In regard to the differential proteins, albumin decreased but this was accompanied by a rise in globulin and fibrinogen. A rise in the reticulocytes preceded a rise in hemoglobin and was associated with a rise in the red cells and plasma proteins. The serum bilirubin was higher in the first few days, although within normal limits, and the urobilinogen in the urine was noticeable in several cases.

The authors then discuss these findings and their causation, concluding with the suggestion that the anemia occurring during the first 10 days after injury is not due to blood loss or hemolysis but to a disturbance of hemoglobin synthesis dependent upon disordered liver function. In view of their findings in these patients they stress the importance of a high protein intake in all surgical cases.

G. ALLEN LIVA, M.D.

Corcoran, A. C. and Page, Irvine H.: Crush Syndrome. *J. Am. M. Ass.* 1947 134 436.

Traumatic shock is thought of as an acute state from which no threatening conditions persist. Crush syndrome was rediscovered, named and studied on a wider scale during the London blitz.

Typically the syndrome is initiated by crushing of a limb or occlusion of its arterial supply for several hours. Release from debris or restoration of the blood flow is followed by swelling with wheal formation at the sites of compression. The limb becomes hard paralyzed and anesthetic. Loss of plasma into the area of injury causes hemoconcentration. Shock may supervene and be relieved by transfusion. Urine passed during the first 24 hours is colored red or brown with myoglobin, contains albumin, and shows many brown and black granular pigment casts. The urinary output and specific gravity thereafter diminish. The patient passes into rest, less delirium with thirst and vomiting. Arterial pressure and the concentration of serum potassium are increased. Azotemia rises until about the sixth day when death suddenly occurs in about two-thirds of the cases. The volume of urine of those who are to recover increases about this time and their renal function is slowly restored in the succeeding months.

The exact mechanism of hemoglobinuric nephrosis is not established. There is compelling evidence which associates it with urinary acidity.

Others believe that renal injury in the crush syndrome is a consequence of prolonged arterial hypotension with renal ischemia and anoxia.

The mechanism of crush syndrome can be visualized as follows:

Vasoconstrictive renal ischemia occurs with the onset of shock or even of injury. The urine is acid and small in volume. The muscle cells are fragmented so that when the circulation is restored through the crushed areas myoglobin diffuses into the blood whence it is filtered into the renal tubules. Thus the conditions of pigmentary precipitation (aciduria oliguria) are encountered while the kidney is further damaged by the lack of blood flow. It has been demonstrated that hemoglobin precipitation in the renal tubules is facilitated by prior injury whether from ischemia or injection of a nephrotoxin (tartrate). However it is not clear from these experiments whether the factor responsible was cellular injury as such, or oliguria resulting therefrom. In either case the conditions of precipitation are present in crush syndrome.

The major renal lesion in crush syndrome is epithelial. Renal epithelium is sensitive to a variety of toxins.

Treatment is directed toward the underlying mechanisms.

The primary problem in renal damage is the renal ischemia. This is due to vasoconstriction.

Thus the basic preventive measures in crush syndrome are (1) pressure bandaging of the injured limb (2) rapid treatment of shock with restoration of the blood pressure (3) provision of adequate fluid (4) provision of a diuretic and (5) the administration of an alkali.

HARRY W. FOX, M.D.

Brush B. E., Lam, C. R. and Ponka J. L.: Wound Healing Studies on Several Substances Recommended for the Treatment of Burns. *Surgery* 1947 21: 662

Although marked advances have recently been made in the therapy of burns there is still a considerable vogue for the use of ointments and other topical applications. Few of the agents employed have been subjected to critical examination of their effect on wound healing.

The authors have investigated a group of substances commonly employed in the treatment of burns, as well as some experimental ointments submitted by the Subcommittee on Burns and Surgical Infections of the Committee on Medical Research. The substances tested were tannic acid solution, tannic acid in tragacanth jelly, commercial tannic acid jelly (Amertan), petrolatum gauze, two kinds of carbowax ointment, a mineral oil and aluminum monostearate preparation, proflavine dihydrochloride ointment, and hydrosulfosal solution. Each substance was tested on 12 guinea pigs. The abdomen was aseptically prepared and two circular cutaneous defects were made, one on each side of the midline. The wound on the left was used as the test wound and the other as a control. The wounds were outlined on sterile cellophane, and the test material was then applied to the test wound. Sterile dressings were applied firmly in the wounds and were changed every 2 days until the wounds had both healed. At each change of dressings new cellophane records of the size of the wound were made.

None of the substances studied showed an appreciable accelerating effect on wound healing. All the tannic acid compounds showed definite inhibition of wound healing. Petrolatum gauze had no effect. Both types of carbowax ointment delayed wound healing slightly. Proflavine dihydrochloride and hydrosulfosal were mildly inhibitory. The stearate was also slightly inhibitory. The grease-treated wounds healed in the same time as the controls.

B. F. LOCKSBURY, M.D.

Colebrook, L., Duncan, J. M., and Butterfield, W. J. II: Added Infections in Burns. *Lancet* London, 1947 1: 321

This article is a report of further study of infection acquired apart from dressing of the wound

The investigation overlaps that reported by Bourdillon and Colebrook (1946). It deals with the 12 months from August 1, 1945 to August 1, 1946 during which period was recorded the time when the wound was dressed, the type of cover (perfect or imperfect) on the wound and exposure of the wound (if any) since the last dressing.

Daily records were kept showing the order in which patients were dressed, the clinical condition and the bacteriological flora of the burned areas at the time of dressing.

Organisms used as indicators for added infection are the hemolytic streptococcus, the *Pseudomonas pyocyanea* and the *Bacillus proteus* because of ease of identification and because these 3 are more often associated with delayed healing and unsuccessful grafting operations.

In most cases the burn was covered with tulle gras, then dry sterile gauze, then absorbent cotton and last, crepe bandages. A light shell of plaster of Paris is often applied in the cases of children.

The term "added infection" is used to denote the growth of 1 of the 3 indicator organisms from burned areas which had been free from such infection on admission, such infection having been obtained during the hospital stay.

Included in the authors' records in this article were records of whether the burned areas were in completely covered and whether they were liable to infection from without.

In the period covered by this article no dressings of fresh burns were carried out in the open wards. All first dressings were done in rooms which were not supplied with dust free air. All except 107 of the subsequent 1,419 dressings were done in a dust free atmosphere.

The data summary showed that of the 229 patients with burns free from all indicator organisms on admission 29 (13%) acquired one or more during their hospital stay. In 28 of these the infection probably was acquired in the ward during the interval of dressing.

It is shown that the incidence of added infection was closely related to success or failure in keeping the burned areas adequately covered with dressings. It also seemed obvious to the authors that the added infection had arisen by transfer of infective material from sources outside of the patient.

Clouds of pathogens are liberated during bed changes and when dressings are applied. The clothing of doctors, nurses, and visitors (especially those with throat infection), flies, drinking utensils, bed pans, thermometers, toys, and materials of occupational therapy are other sources of infection.

The following procedures seem to the authors of chief importance in the prevention of added infection in the wards:

1. Maintenance of perfect cover. The recommended dressing is to cover the burned area with sterile gauze, then wool (3/4 to 1 inch thick) and finally crepe bandage. This should be supported by adhesive and in an active child by a light plaster-of-

Paris cast over the crepe bandage. Daily careful examinations of the bandage during ward rounds are essential.

2. Restraint of bacterial growth on the burns, and elimination of reservoirs of infection. For routine dressing the authors have used for the past 3 years a cream containing penicillin and sulfathiazole in a bland base (Clark *et al.* 1943) with very satisfactory results. After the first application of this cream, the dressings are left undisturbed for from 7 to 12 days, and subsequent dressings for from 5 to 7 days. If hemolytic streptococci were found on culture a course of 4 or 5 applications of penicillin cream at 2 day intervals was instituted with excellent results in eliminating reservoirs of this organism.

3. Rapid repair of epithelial skin covering. It is difficult to keep large granulating surfaces free from all added infections for many weeks. The longer the burned area is kept uncovered with epithelium the more fibrous tissue is formed beneath it; this often leads to serious dysfunction. For this reason grafting as early as possible is recommended and should be repeated without delay. Repeated regrafting with stored skin or with small grafts should be a routine dressing procedure.

4. Antidust measures and the elimination of flies. Oiling of blankets after laundering (Harwood *et al.* 1944) and of floors (Andrews *et al.* 1940) are 2 simple methods advocated. Frequent spraying of D.D.T. in white spirit plus screening will take care of flies.

5. Segregation of infected cases in cubicles. Ideal burn units would be single units for half of the bed accommodations and for the rest bed rooms to accommodate 2 to 4 patients.

6. Routine purification of the air of wards. Whatever methods are used, frequent cleaning of the air of wards with burn patients is a desirable goal.

The incidence of added infection in burns which were found to be imperfectly covered when redressed was 10 times as high as that of the burns which had a perfect cover during the interval between dressings.

The problem of controlling added infections of burns with the *Staphylococcus aureus* remains untouched but the authors state that the elimination of these infections is likely to present great difficulties because of the great prevalence of this organism.

DAVID H. RATO M.D.

Ritter A., and Pletscher A.: The Treatment of Wounds with Sulfonamides. A Clinical and Experimental Histological Report. (Wundbehandlung mit Sulfonamiden. Klinischer und experimenteller histologischer Beitrag) *J. internat. chir. Brux.* 94b, 6-61.

The author studied the effects of the various sulfonamides on clean and infected wounds in guinea pigs. The sulfonamides used were chlorbutol, ilicosin, haptocil and irgamid which are the European equivalent of sulfanilamide, sulfathiazole, sulfapyridine and sulfadiazine. They studied histologically

the tissue in which the sulfa drugs had been introduced 1, 12 and 24 hours later and from 2 to 14 days later. They found that the degenerative changes in the subcutaneous tissue and the muscle were somewhat more marked following the use of sulfonamides than in the controls, but also found that the connective tissue regeneration was greater at the same time. They found that edema and cellular infiltrations were less marked in infected cases following the chemotherapeutic treatment, but that the wounds did not heal as readily as the infected ones even though the connective tissue regeneration was more pronounced. They state that the slight delay in wound healing was usually caused by too much sulfonamide powder or crystal in the wound and around the tract of the wound.

They conclude from their surgical experience and their experimental work that the local application of sulfonamide in infected or traumatic wounds is definitely beneficial and increases tissue reaction and connective tissue regeneration. They warn against using too much drug, and emphasize that the use of sulfonamide drugs should never take the place of primary surgical treatment of the wound.

GEORGE PERRET M.D.

Domagk, Gerhard: Present Day Status of Chemotherapy of Bacterial Infections by Sulfonamides. (Der derzeitige Stand der Chemotherapie bakterieller Infektionen mit den Sulfonamiden) *Dtsch. med. Wschr.* 947 72 6, 71.

The bacteriostatic effect of sulfonamides is dependent on different factors. One of these is the chemical constitution. Those compounds in which the sulfonamide group (SO_2NH_2) is in a p-position to the amino group are more effective than others. The bacteriostatic effect is not diminished when the hydrogen atoms in the NH group as well as in the SO_2NH_2 group are substituted. Of special interest are experiments with certain anaerobic organisms, like the *Bacillus welchii*. In vitro these bacilli are very little influenced by the most used sulfonamides like prontosil, sulfapyridine, and sulfathiazole, but they show a specific sensitivity to the German product marfanil $\text{H}_2\text{N}-\text{H}_2\text{C}-\text{SO}_2\text{NH}_2$ and its derivatives in which the amino group is not linked directly to the phenol ring but to a methyl group in p-position to the sulfonamide group.

The simplest method to test the influence of a compound on different species of bacteria is to add the drug to ordinary laboratory media, preferably agar or blood agar and to inoculate the bacillus on this medium. The degree of the effect depends on 3 factors: the species and strain of the organism, the compound used and the culture medium. The bacteriostatic effect varies considerably with the same compound in different media. In vitro, bacteriostasis occurs in concentrations between 1 to 10,000 and 1 to 80,000.

It would however be wrong to draw too far reaching conclusions from laboratory experiments.

Many compounds, e.g. the original prontosil, which are quite successful clinically and in animal experiments have only a poor bacteriostatic effect in vitro. The reasons for this difference are manifold. In the first place, some drugs are changed chemically after their introduction into the organism into substances which are more effective than the original product. Furthermore, the phagocytic action of the sulfa compounds and the phagocytic action of the leucocytes, histiocytes, and other elements of the reticuloendothelial system is necessary to develop an optimal action on the bacilli. Phagocytosis of the organisms which have been paralyzed by the sulfonamide compounds is essential for a full therapeutic effect. It has been shown that bacteria were phagocytized in the presence of sulfonamides if they had not been attacked by phagocytes previously to the sulfonamide treatment. This change is due to the bacteriostatic effect of the drug not to any stimulation of the leucocytes.

In animal experiments with phlegmonous cellulitis caused by highly virulent streptococci the author showed that in untreated animals no walling off of the focus occurred and the phlegmon spread without any resistance. Very soon after onset of the sulfa treatment, however, more and more leucocytes could be observed to be invading the focus phagocytizing the streptococci and walling off the entire area.

Although the author agrees that the action of sulfa compounds is mainly bacteriostatic, he believes that some bactericidal effect takes place too especially under conditions unfavorable to the growth of the organisms, such as poor media and increase of temperature to 39 or 40° C. This observation is further supported by the fact that patients with high fever show a quicker and more intensive response to sulfa treatment than those with low grade fever or normal temperatures.

During the war infections with the different bacilli of gas gangrene were rampant in Germany not only in war wounds but also complicating appendicitis, cholangitis, perforating peptic ulcer and other abdominal pathology. In these cases, topical and systemic application of the sulfonamides gave excellent results. Whereas before the sulfonamide period the mortality in perforating appendicitis was as high as 14 per cent, it dropped to 1 per cent under sulfa treatment.

As to wounds, especially battle wounds which were exposed to infection the author suggests routine treatment (topical and systemic) with a mixture of a sulfa compound, one effective against aerobic, the other against anaerobic bacilli.

The indications, the technique of application and the dosage are discussed in detail, as well as the different compounds which have been used in Germany during the war (Since the author uses only proprietary names in his article it could not be ascertained in most cases what compounds were used (marfanil, marbadal, debenal). The German eludron is identical with sulfathiazole.

The author stresses the importance of topical application in surgical cases
WERNER M. SOLMANN, M.D.

Shaffer J O : Intra Arterial Penicillin in the Surgical Treatment of Infections of the Extremities. *Surgery* 1947 : 31 693

The author describes his method of injecting penicillin intra-arterially in the treatment of infections of the extremities. The intra arterial route of administration of drugs was apparently first utilized by Heddaus, in 1914, when he injected antitetanic serum into the carotid. Subsequently numerous other workers have employed a great variety of therapeutic agents, seeking to obtain a high local concentration within certain tissues by injection of the drug directly into the artery supplying those tissues. In infectious of the extremities of the large areas are involved, and the penicillin penetration becomes a problem because of impaired blood supply or because the infection lies within bony or fascial pockets. When penicillin is injected intra-arterially the dilution remains minimal, and the blood pressure forces the concentrated drug into the tissues.

The author makes use of a blood pressure cuff applied to the extremity distal to the point of injection and inflated to a subdiastolic pressure. This prevents the return of venous blood and yet permits the continued arterial pressure to distribute the drug. An ingenious use of radioactive phosphorus, traced to its ultimate destination by Geiger counters, demonstrated that this method of injection gave a higher concentration of injected material for a longer period than did intravenous injection or intra-arterial injection without a cuff or with a cuff inflated to supra diastolic pressure. The actual injection is done with a 20 c.c. syringe attached to a 20 gauge needle 3/4 inches long. The point of maximum pulsation of the femoral artery just below the inguinal ligament (or the brachial at the elbow or the distal portion of the axillary for the upper extremity) is palpated, and the artery is steadied with the index and middle fingers of the left hand. The needle is then inserted perpendicular to the skin between the steady fingers. A pulsating bright red stream showing in the syringe indicates that the needle point is within the arterial lumen. When the injection has been completed the site is subjected to temporary digital pressure to prevent hematoma formation. The dosage used by the author has been 50,000 Oxford units of penicillin in 10 c.c. of normal saline. One or two daily doses should be given until optimal results have been obtained.

Types of infections successfully treated by the author in his series of 40 patients included diabetes, arteriosclerosis, osteomyelitis, suppurative joints, infected ulcers, infected operative incisions, and various types of gangrene. He observed no hematoma in any of his cases as a result of the arterial puncture.

The only contraindications to the procedure are phlebotromboses and infections of the skin overlying the puncture site.

ing the proposed site of injection. When procaine is given along with the penicillin, local anesthesia is obtained and simple surgical procedures may be performed
R. F. LOONAN, M.D.

Bowle, J. H., and Borcar, M. D.: Continuous Injection of Penicillin: the Secunderabad Apparatus. *Lancet* London 1947: 477

The authors—a penicillin research team (India Command) at Secunderabad—cite their experiences in treating war wounds chiefly unhealed compound fractures of the femur. Because of the difficulties experienced in these cases when penicillin was administered by three-hourly injections or by the ordinary Army saline-giving sets, they were prompted to develop a method for the continuous administration in small volume. They concluded that penicillin should be injected continuously in as small a volume as possible and that rubber tubing be avoided. Since the amount of sodium penicillin commonly administered in 24 hours is readily soluble in 2 milliliters of water it was believed that a syringe should be attached to the patient and some means evolved to depress the plunger slowly over a period of hours.

The authors give a detailed explanation of this apparatus which is fitted with needles which are suitable for subcutaneous, intramuscular or intravenous use.

The authors describe the advantages of the apparatus as follows: (1) an absolutely constant injection ensuring a maximum constant blood penicillin level at a minimal expenditure of the drug; (2) possibility of blockage in the needle during injection is eliminated; (3) supervision is unnecessary except when set up on the patient and when recharged at 24 hour intervals; (4) the small volume (2 ml.) in which the penicillin is injected reduces proportionately (a) pain and local edema and (b) deterioration of the penicillin at room temperature; (5) the patient is not confined to bed but to the length of his cable and may leave the ward by separating the cable at an appropriate point; (6) booster doses can be given at any time; (7) according to the number of cable adapters fitted to the distribution box on the motor, any number of patients in a ward can be treated simultaneously; (8) there is no contact with rubber tubing; and (9) it may be used in research on the action of other drugs.

The authors observed that blood-penicillin levels became constant throughout the day and night after a "building up" period directly proportional to the dose and inversely proportional to the patient's weight. They found that for every 0.02 unit of penicillin required in the serum, a dose of 25,000 units a day per 140 pound of body weight must be given. From this datum the dose required to obtain the required blood-penicillin level in any patient can be calculated by proportion. The dose of penicillin required for an particular patient may be estimated if the resistance of the invading pathogen and the patient's body weight are known.

C. ALBIN LIVA, M.D.

ANESTHESIA

11 Ghies, E. S. R.: Refrigeration Anesthesia. *Brit. M. J.*, 1947: 701

Twenty-five cases of amputation under refrigeration anesthesia are reported with details of the individual cases and the technique employed. This method of anesthesia was reserved for "bad risk" cases. Progressive gangrene of the foot complicated by severe pain or infection was most frequently the cause for amputation. The underlying constitutional pathology was "atherosclerosis" or "diabetes mellitus."

The technique of refrigeration used is simple. No costly apparatus is necessary. A wooden box lined with galvanized iron sheeting is filled with chipped ice and this is kept at room temperature overnight to allow the sharp edges to be melted away. The tourniquet is not an essential requirement at any stage of the procedure and may be dispensed with entirely but its employment is advisable. The period of time for which the limb is refrigerated depends on the relation of the local lesion to the general condition of the patient. If the former is the cause of depression of the latter then by cooling the lesion to 5°C at which level metabolism is minimal, it becomes physiologically disconnected from the body. If the patient has severe pain and toxemia the affected area of the limb is refrigerated for several days without a tourniquet several hours before operation the refrigerated area is extended to just above tourniquet level. The minimum time for which a limb may be safely refrigerated before operation varies from 2 to 3 hours. Amputation is carried out as in cases with the usual form of anesthesia. There is no primary shock despite the fact that the patient remains fully conscious throughout surgery.

Complications were occasionally secondary shock, bronchopneumonia, and most frequently infection.

Experimental and practical evidence is convincing that refrigeration anesthesia is a sure means of excluding a constitutional depressant, and a useful measure in certain "bad risk" cases.

JOHN E. KILPATRICK, M.D.

Saklad, Meyer; Dwyer, Clement S.; Kronenberg, Sanford; Neves, Edmund; and Borkin, Morris: Intraspinal Segmental Anesthesia: A Preliminary Report. *Anesthesiology* 1947: 8: 270

A technique of obtaining a segmental distribution of spinal anesthesia is presented. A limited number of spinal nerve roots are bathed by an anesthetic solution within the subarachnoid space. This is accomplished by injecting a solution of pontocaine hydrochloride in a dilution of 1 to 1000 through a fine catheter which has been passed cephalad within the subarachnoid space for a distance of from 15 to 25 cm. The total dose of pontocaine is a small fraction of that ordinarily required for spinal anesthesia.

This preliminary report includes the authors' first 25 cases of intraspinal segmental anesthesia for abdominal surgery. In 20 cases the anesthesia was sat-

isfactory and in a cases there was technical failure because of faulty placement of the catheter.

The dilute solution of pontocaine hydrochloride in spinal fluid may be considered to be nearly isotonic, isobaric, and isohydronic. Local toxic effects and neurologic sequelae are, therefore, less likely to result. The accurate deposition of such a weak solution of anesthetic agent within the subarachnoid space reduces the hazard of respiratory paralysis.

Persistence of motor power in the lower extremities may result in a more efficient return flow of blood to the heart and may have a beneficial effect on the systemic circulation during anesthesia. Maintenance of muscle tone in the legs may result in a decreased incidence of phlebothrombosis and postoperative urinary disturbances may be less common.

MARY FRANCES POT, M.D.

Dripps, Robert D.; and Sergeant, Warren F.: Use of a New Curarizing Agent, Dihydro-Beta Erythroidine for the Production of Muscular Relaxation during Anesthesia and Surgery *Anesthesiology* 1947 8 241

This preliminary report concerns the intravenous administration of a relatively new curarizing agent dihydro-beta-erythroidine to 215 patients receiving general anesthesia. No attempt was made to select cases. Cyclopropane ethyl ether sodium pentothal and nitrous oxide were the anesthetic agents employed.

Dihydro-beta-erythroidine decreased or abolished the conduction of impulses from nerve to skeletal muscle in a curariform fashion. Muscles were af-

fected in the same sequence as with curare. Satisfactory surgical relaxation was recorded in 96 per cent of the cases. The drug seems indistinguishable in this regard from curare. The decrease in respiratory minute volume was accomplished almost entirely by a diminution in depth per breath. Respiratory rate remained relatively unchanged or increased. A paralytic effect was exerted on the striated laryngeal muscles.

Hypotension occurred in 86 per cent of the patients. The amount of blood pressure decrease was related in part at least to the amount of drug administered. The impression was gained that the degree of hypotension produced was also related to the level of anesthesia. The fall in blood pressure was a transient phenomenon as a rule lasting from 5 to 10 minutes. It is thought the reaction is related primarily to depression of the medullary vasoconstrictor center or to paralysis of the sympathetic ganglia with diminution of the arteriolar tone.

The circulatory depressant action described suggests the possibility of direct depression of the medullary vasomotor center. There is also other evidence in man and animals which indicates that curare and the erythrine alkaloids depress the central nervous system.

The initial dose which the authors recommend is between 50 and 75 mgm. if ethyl ether anesthesia is employed and between 75 and 100 mgm. if the anesthetic agent is cyclopropane. The major complication of intravenous administration of dihydro-beta erythroidine was the hypotension.

MARY FRANCES POT, M.D.

ing the proposed site of injection. When procaine is given along with the penicillin, local anesthesia is obtained and simple surgical procedures may be performed.

B. F. LOCKHART, M.D.

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The authors—a penicillin research team (India Command) at Secundusbad—cite their experiences in treating war wounds, chiefly unhealed compound fractures of the femur. Because of the difficulties experienced in these cases when penicillin was administered by three hourly injections or by the ordinary Army saline-giving sets, they were prompted to develop a method for the continuous administration in small volume. They concluded that penicillin should be injected continuously in as small a volume as possible and that rubber tubing be added. Since the amount of sodium penicillin commonly administered in 24 hours is readily soluble in 2 milliliters of water it was believed that a syringe should be attached to the patient and some means evolved to depress the platen slowly over a period of hours.

The authors give a detailed explanation of this apparatus which is fitted with needles which are suitable for subcutaneous, intramuscular or intravenous use.

The authors describe the advantages of the apparatus as follows: (1) an absolutely constant injection ensuring a maximum constant blood penicillin level at a minimal expenditure of the drug; (2) possibility of blockage in the needle during injection is eliminated; (3) supervision is unnecessary except when set up on the patient and when recharged at 24 hour intervals; (4) the small volume (5 ml.) in which the penicillin is injected reduces proportionately (a) pain and local edema, and (b) deterioration of the penicillin at room temperature; (5) the patient is not confined to bed but is the length of his cable, and may leave the ward by separating the cable at an appropriate point; (6) booster doses can be given at any time; (7) according to the number of cable adapters fitted to the distribution box on the motor, any number of patients in a ward can be treated simultaneously; (8) there is no contact with rubber tubing; and (9) it may be used in research on the action of other drugs.

The authors observed that blood penicillin levels became constant throughout the day and night after a "building up" period directly proportional to the dose and inversely proportional to the patient's weight. They found that for every 0.05 unit of penicillin required, the serum a dose of 25,000 units a day per 140 pound of body weight must be given. From this datum the dose required to obtain the required blood-penicillin level in any patient can be calculated by proportion. The dose of penicillin required for any particular patient may be estimated if the resistance of the invading pathogen and the patient's body weight are known.

C. ALLEN LIVA, M.D.

ANESTHESIA

Hughes, E. S. R.: Refrigeration Anesthesia. *Brit Med J* 1947 1: 761

Twenty five cases of amputation under refrigeration anesthesia are reported with details of the individual cases and the technique employed. This method of anesthesia was reserved for "bad risk" cases. Progressive gangrene of the foot complicated by severe pain or infection was most frequently the cause for amputation. The underlying constitutional pathology was "atherosclerosis" or "diabetes mellitus."

The technique of refrigeration used is simple. No costly apparatus is necessary. A wooden box lined with galvanized iron sheeting is filled with chipped ice and this is kept at room temperature overnight to allow the sharp edges to be melted away. The tourniquet is not an essential requirement at any stage of the procedure and may be dispensed with entirely, but its employment is advisable. The period of time for which the limb is refrigerated depends on the relation of the local lesion to the general condition of the patient. If the former is the cause of depression of the latter then by cooling the lesion to 5°C. at which level metabolism is minimal, it becomes physiologically disconnected from the body. If the patient has severe pain and toxemia the affected area of the limb is refrigerated for several days without a tourniquet several hours before operation the refrigerated area is extended to just above tourniquet level. The minimum time for which a limb may be safely refrigerated before operation varies from 2 to 3 hours. Amputation is carried out as in cases with the usual form of anesthesia. There is no primary shock despite the fact that the patient remains fully conscious throughout surgery.

Complications were occasionally secondary shock, bronchopneumonia and most frequently infection.

Experimental and practical evidence is convincing that refrigeration anesthesia is a sure means of excluding a constitutional depressant, and a useful measure in certain "bad risk" cases.

JOHN E. KARABIN, M.D.

Saklad, Mayer, Dwyer, Clement B., Kronenberg, Sanford, Neves, Edmund, and Sorlin Morris: Intraspinal Segmental Anesthesia: A Preliminary Report. *Anesthesiology* 1947 8: 270.

A technique of obtaining a segmental distribution of spinal anesthesia is presented. A limited number of spinal nerve roots are bathed by an anesthetic solution within the subarachnoid space. This is accomplished by injecting a solution of pontocaine hydrochloride in a dilution of 1 to 1000 through a fine catheter which has been passed cephalad within the subarachnoid space for a distance of from 15 to 25 cm. The total dose of pontocaine is a small fraction of that ordinarily required for spinal anesthesia.

This preliminary report includes the authors' first 24 cases of intraspinal segmental anesthesia for abdominal surgery. In 20 cases the anesthesia was sat

ADVANCE REGISTRATION

The hospitals and medical schools of New York afford accommodations for a large number of visiting surgeons. However, in order to insure against overcrowding, attendance at the Congress will be limited to the number that can be accommodated at the clinics and meetings. It is therefore expected that surgeons who wish to attend the Congress will register in advance.

Because of greatly increased costs and expenses to which the College will be subjected this year in connection with its New York Clinical Congress, the Board of Regents has found it necessary to require a registration fee of \$5.00 for Fellows and for endorsed Junior Candidates. Non-Fellows attending as invited guests of the College will pay a fee of \$10.00. No fee will be required of invitees of the class of 1947.

To each surgeon who registers in advance a formal receipt will be issued. This is to be exchanged for a general admission card upon his registration at headquarters during the Congress. This card is not transferable and must be presented in order to obtain clinic tickets and admission to scientific sessions.

The registration desk will be open from 4:00 to 9:00 p.m. on Sunday, September 7, in order to permit surgeons to obtain tickets for the Monday clinics. A new plan is to be adopted in New York of distributing clinic tickets on the day prior to the clinics from 9:00 a.m. to 5 p.m. Any remaining tickets will be available at 7:00 a.m. the same day on which the clinics are held.

HOTEL RESERVATIONS

Although the prospect is that the hotel situation in New York will be more favorable than it would have been last year nevertheless there is still a critical shortage of hotel rooms and early reservations are most desirable. In making these, communications should be addressed to the New York Convention Bureau, through which all reservations for the Clinical Congress are to clear. No correspondence should be sent directly to the hotels. A letter has been sent to Fellows in which the procedure is outlined. With this letter was enclosed a form to be used in making reservations. Choices of hotels may be designated. The following hotels are recommended by the Committee.

	Minimum Rates with Bath	
	Single	Double
Allerton House, 143 East 30th Street.	\$8.75	\$
Allerton House for Women, 50 East 37th Street.		8.00

Minimum Rates with Bath
Single Double

Ambassador Park Avenue and 5th Street.	\$6.00	
Astor Broad 7 and 44th Street.	3.50	\$4.00
Barham (Women) Lexington Avenue and 63rd Street.	3.50	
Barclay 1 East 48th Street.	6.00	8.00
Belmont Plaza, Lexington Avenue and 49th Street.	4.00	6.00
Beverly Lexington Avenue and 50th Street.	5.00	
Billmore, Madison Avenue and 43rd Street.	5.50	7.50
Bristol, 120 West 48th Street.	3.50	3.50
Capital, 5th Street and 8th Avenue.	3.00	4.50
Carlisle, Madison Avenue at 76th Street.	6.00	
Chesterfield, 150 West 49th Street.	50	4.00
Commodore, Lexington Avenue and 42nd Street.	3.50	5.50
Concourse Plaza, Grand Concourse and 61st Street.	3.50	5.50
Cornhill Arms, 31 West 3rd Street.	2.50	4.00
Delmonico, 503 Park Avenue.	6.00	8.00
Emet House, 60 Central Park South.	6.00	8.00
Fifth Avenue Hotel, 24 Fifth Avenue (9th Street).	4.00	6.00
Governor Clinton, 31st Street and 7th Avenue.	3.30	4.40
Henry Hudson, 353 West 57th Street.	2.50	3.50
Kensmore Hall, 45 East 3rd Street.	00	3.50
Lexington, 48th Street and Lexington Avenue.	4.00	6.00
Luxor Baths Hotel, 3 West 46th Street.	5	
McAlpin, Broadway and 34th Street.	3.30	4.45
Martinsique, Broadway at 12nd Street.	75	3.85
Nickson House, 1 East 36th Street.	3.50	4.00
New Weston, Madison Avenue and 50th Street.	4.00	7.00
New Yorker, 34th Street and 8th Avenue.	3.85	5.50
Paramount, 46th Street, West of Broadway.	3.00	3.00
Park Central, 7th Avenue and 35th Street.	4.00	6.00
Parkside, 18 Gramercy Park South.	75	
Pennsylvania, 7th Avenue and 33rd Street.	3.85	5.50
Piccadilly, 227 West 45th Street.	3.00	5.00
Plymouth, 143 West 40th Street.	50	3.50
President, 234 West 48th Street.	50	4.00
Prince George, 14 East 28th Street.	2.50	4.00
Roosevelt, Madison Avenue and 45th Street.	4.50	6.50
Shelton, 40th Street and Lexington Avenue.	3.50	5.00
Taft, 7th Avenue and 50th Street.	3.00	5.00
Times Square, 43rd Street and 8th Avenue.	5	4.00
Tudor, 304 East 42nd Street.	50	
Victoria, 7th Avenue and 5th Street.	3.00	4.50
Waldorf Astoria, 50th Street and Park Avenue.	7.00	
Warrick, 54th Street at Sixth Avenue.	5.00	
Wellington, 7th Avenue and 35th Street.	3.00	4.50
Woodstock, 27 West 43rd Street.	3.00	5.00

isfactory and in 4 cases there was technical failure because of faulty placement of the catheter.

The dilute solution of pontocaline hydrochloride in spinal fluid may be considered to be nearly isotonic, isobaric and isohydronic. Local toxic effects and neurologic sequelae are therefore less likely to result. The accurate deposition of such a weak solution of anesthetic agent within the subarachnoid space reduces the hazard of respiratory paralysis.

Persistence of motor power in the lower extremities may result in a more efficient return flow of blood to the heart and may have a beneficial effect on the systemic circulation during anesthesia. Maintenance of muscle tone in the legs may result in a decreased incidence of phlebotrombosis and postoperative urinary disturbances may be less common.

MARY FRANCES POE, M.D.

Dripps, Robert D.; and Sargent, Warren F.: Use of a New Curarizing Agent Dihydro-Beta Erythroidine, for the Production of Muscular Relaxation during Anesthesia and Surgery. *Anesthesiology* 1947 8: 241.

This preliminary report concerns the intravenous administration of a relatively new curarizing agent dihydro-beta-erythroidine, to 215 patients receiving general anesthesia. No attempt was made to select cases. Cyclopropane ethyl ether sodium pentothal and nitrous oxide were the anesthetic agents employed.

Dihydro-beta-erythroidine decreased or abolished the conduction of impulses from nerve to skeletal muscle in a curariform fashion. Muscles were af-

fected in the same sequence as with curare. Satisfactory surgical relaxation was recorded in 96 per cent of the cases. The drug seems indistinguishable in this regard from curare. The decrease in respiratory minute volume was accomplished almost entirely by a diminution in depth per breath. Respiratory rate remained relatively unchanged or increased. A paralytic effect was exerted on the striated laryngeal muscles.

Hypotension occurred in 86 per cent of the patients. The amount of blood pressure decrease was related in part at least to the amount of drug administered. The impression was gained that the degree of hypotension produced was also related to the level of anesthesia. The fall in blood pressure was a transient phenomenon as a rule lasting from 5 to 10 minutes. It is thought the reaction is related primarily to depression of the medullary vasoconstrictor center or to paralysis of the sympathetic ganglia with diminution of the arteriolar tone.

The circulatory depressant action described suggests the possibility of direct depression of the medullary vasomotor center. There is also other evidence in man and animals which indicates that curare and the erythrine alkaloids depress the central nervous system.

The initial dose which the authors recommend is between 50 and 75 mgm. if ethyl ether anesthesia is employed and between 75 and 100 mgm if the anesthetic agent is cyclopropane. The major complication of intravenous administration of dihydro-beta erythroidine was the hypotension.

MARY FRANCES POE, M.D.

with or without mediastinal shift to the opposite side. In the presence of associated pneumothorax there is a horizontal fluid level.

Loculated or encapsulated hemothorax is characterized by fibrous pleural bands enclosing an accumulation of blood, with or without air at various levels in the pleural cavity. On the roentgenogram loculated hemothorax may be represented as various sized and irregularly distributed fluid levels.

Clotted hemothorax occurs in from 4 to 6 per cent of cases with hemothorax. Roentgenologically clotted hemothorax may assume a variety of appearances. There may be mottling, multiple fluid levels, densely thickened pleurae, or signs of traction. These may appear alone or in combinations.

Empyema from pleural sepsis in battle casualties is given variously from 21.9 per cent in penetrating, and 11.3 per cent in nonpenetrating wounds to 23 and 33 per cent respectively.

Atelectasis is commonly found in association with thoracic wounds subsequent to compression phenomena, injury to the bronchial tree, and a mucus plug occurring as a postoperative complication. Its appearance on the roentgenogram varies from streak to platelike densities to massive opacities. In the latter instance there is retraction of the mediastinum to the same side, narrowing of the rib interspaces, and elevation of the diaphragm.

Bronchopleural fistulas occur infrequently in thoracic wounds and generally follow in the wake of empyema, sinus tract or surgery.

Blast or concussion injuries to the lungs following waves of compressed air brought to bear upon the thorax occur in about 2 or 3 per cent of the cases. The roentgenological features of blast injury are treelike densities involving the pulmonary fields usually most prominent at the bases.

Transdiaphragmatic injuries occur in 10 per cent of battle injuries of the chest and have a 25 to 40 per cent mortality rate. Hepatopleural fistulas may be present or become manifest after admission. In penetrating wounds of the diaphragm immediate or delayed herniation of the abdominal organs may follow. On the roentgenogram, diaphragmatic hernia must be differentiated chiefly from empyema cavity, loculated pneumothorax, interlobar fibrosis, lung abscess, eventration of the diaphragm, pulmonary cyst, and giant emphysematous blebs. Subphrenic abscesses constitute an additional complication.

Penetrating missiles occasionally leave roentgenologic evidence of their passage through lung tissue in the form of tracks. FRANK L. HUNTER M.D.

Henny, G. C., Boone, B. R., and Chamberlain, W. E.: The Electrocardiograph for Recording Heart Motion Improved Type. *Am J Roentg* 94:7 37-40.

The authors report and describe the electrocardiograph for recording motion with use of the roentgenoscope. The apparatus employs a roentgen device which when properly placed,

genoscopic cardiac silhouette translates the motion of this silhouette border into a varying electrical current. The current is recorded with the aid of a standard electrocardiographic machine.

They also describe the construction of a carotid pulse recorder which is used to record the pulse in conjunction with the heart border motion.

FRANK L. HUNTER M.D.

Dexter, Lewis: Venous Catheterization of the Heart. Results, Interpretations, and Value. *Radiology* 94:7 48-45.

The author presents the findings in representative types of congenital heart disease. In the presence of an auricular septal defect, blood usually flows from the left auricle to the right auricle. The venous catheter is helpful in the recognition of this defect by two methods. The catheter may be introduced through the defect or arterial blood may be found in the right auricle.

An uncomplicated defect in the interventricular septum results in the shunting of arterial blood from the left ventricle to the right ventricle. Its recognition by venous catheterization depends on the finding of a significantly higher content of blood in the right ventricle than in the right auricle.

The tetralogy of Fallot consists of pulmonic stenosis, an interventricular septal defect, over-riding or dextroposition of the aorta, and right ventricular hypertrophy. Because of the pulmonic stenosis, venous blood enters the pulmonary artery with difficulty and some is shunted through the septal defect and into the aorta. The patients are, therefore, cyanotic, and suffer mainly from a deficient blood flow through the lungs. The venous catheter may follow one of two courses. It may pass through the stenosed pulmonary valve into the pulmonary artery or it may pass through the interventricular septal defect and go directly into the over-riding aorta.

Patent ductus arteriosus is a vascular anastomosis between the aorta and pulmonary artery which during fetal life serves to bypass the lungs. Its persistence after birth is deleterious, because of the ease with which bacterial vegetations become implanted and also because of the circulatory strain thrown on the left ventricle. Since the flow of blood after birth is from the aorta, where the pressure is high to the pulmonary artery, where it is low there is no cyanosis and the lesion is detectable on venous catheterization by the finding of arterial blood in the pulmonary artery or in other words, blood with a higher oxygen content in the pulmonary artery than in the right ventricle.

Venous catheterization promises to be an important aid in the operative diagnosis of congenital cardiac disease. FRANK L. HUNTER M.D.

Mermer, Ther 48
A com reported

Stenstrom, E. W.: Roentgen & Diacn. *Radiology*, 94:7

ly of Hodge's disease is The cases led into

two series, one series comprising 185 cases, proved histologically, the other, 53 cases in which Hodgkin's disease was found clinically the biopsy specimens having been examined at other institutions. All patients were treated from 1926 through 1949 and were followed through December 1945.

Many different titles have been given to diseases in the lymphoblastoma group. The most common title, and one which avoids confusion, is Hodgkin's disease. The etiology of Hodgkin's disease is still undetermined. Some authors have attributed it to a tubercle bacillus others believe it may be due to a diphtheroid bacillus, hrocella, a filtrable virus, or to a neoplasm.

The symptomatology and physical findings of Hodgkin's disease are variable. Sometimes the only complaint may be enlarged lymph nodes, generally in the cervical or axillary region with systemic symptoms such as fever, weakness, anorexia, and loss of weight. A concomitant upper respiratory infection may be present, with a dry hacking cough which is generally indicative of mediastinal involvement. Dyspnea, cyanosis, or dysphagia are frequently seen when mediastinal involvement is present. Backache may be due to enlarged retroperitoneal lymph nodes. Pruritus is due either to a lymphangitic infiltration in the skin or to enlarged lymph nodes.

The pathology of Hodgkin's disease is divided by most authorities into three groups: (1) the paraneoplasia which is benign; (2) the granuloma which presents a serious prognosis; and (3) Hodgkin's sarcoma, which is highly malignant.

Hodgkin's disease is to be differentiated from leucemia, lymphosarcoma, and tuberculous adenitis. Its incidence in all races is equal and it occurs more frequently in males (70%) than in females. In 37 per cent of cases the disease develops during the third decade of life. In 61 per cent of cases the site of onset is in the peripheral lymph nodes and in 10 per cent of cases in the axillary lymph nodes. In 83 per cent of the cases the cervical lymph nodes were involved.

Each case should be considered individually and no set routine of radiation therapy should be attempted. An average dose of 1,000 tissue roentgens should be given. In some instances as much as 2,000 roentgens may be delivered to the areas in which the condition is localized in cases in which lesions have been present for quite some time, a much heavier dose is necessary. The authors believe it unwise to treat an area prophylactically since it is impossible to determine the site of later tumefaction. Irradiation of the entire body has been carried out, but, in the opinion of the authors, total body irradiation in itself is not sufficient to check the progress of the condition, and it is their belief that it should be given

in conjunction with localized therapy. Fifty to 75 roentgens in air should be administered in cases of enlarged mediastinal lymph nodes (not the usual 250 or 300 roentgens) to avoid edema of the bronchi with compression and respiratory embarrassment.

An analysis of the authors' cases reveals that in general, the survival time of children was shorter than that of adults, the average survival being under 20 months. In the first series of 185 cases there was a 5 year survival rate of 31 per cent, and a 10 year survival rate of 8 per cent. The average duration of life was 33.1 months. MAURICE D. SACHS, M.D.

Warkany J and Schraffenberger E. Congenital Malformations Induced in Rats by Roentgen Rays. *Am J Recul* 1947 56 455

Roentgen rays have been used experimentally in rats to produce malformation, either by irradiating the sex gland of mature animals, or the pregnant female. In the first type, the germ plasma is injured and subsequent generations inbred are malformed. In the second type, the modifications are induced in the embryo which is often deformed at birth. The authors are concerned with the second type and primarily with skeletal malformation.

Pregnant rats of the Sprague-Hawley strain were irradiated on the tenth, eleventh, twelfth, thirteenth, fourteenth, fifteenth, and sixteenth day of gestation with a single dose of from 100 to 1,120 roentgens.

Malformations were induced in rats on the tenth to sixteenth day of gestation. Higher doses produced deformities of the brain, eye, and the upper and lower jaw. The relationship of dose to deformity was in direct ratio. For example, on the fourteenth day of gestation the rats were given a single dose of 190 to 250 roentgens, with the result that the litter appeared normal except for minor deformities of the fingers and toes. A dosage of 800 to 950 roentgens produced severe external malformations with 22 out of 24 cleft palates.

Variations were observed in the same litter. This was attributed to different stages of development.

Skull defects were seen only in those cases in which the rats were irradiated on the tenth, twelfth, thirteenth and, in a few instances, fourteenth day of gestation. Angulation of the ribs was seen in those rats which were irradiated on the fifteenth and sixteenth day of gestation. Cleft palate was particularly noted on the fifteenth day, the vertebral column was not affected.

Of the 622 young rats obtained from 144 mothers, 485 had skeletal deformities, primarily confined to the skull, cleft palate, short mandible, and angulation of the ribs, arms, and legs.

MAURICE D. SACHS, M.D.

1. Cysts secondary to fetal structural defects
 - a. Those resulting from failure of involution of normal fetal tracts, e.g. thyroglossal and bronchial cysts, Rathke's pouch cyst.
 - b. Aberrant tissues, e.g. accessory thyroid gland.
 - c. Cystic disease e.g. polycystic kidney and pulmonary hepatic, or pancreatic cyst.
2. "True" tumors of embryonal or differentiated structure
 - a. Teratomas, teratoid tumors, and dermoids
 - b. Tumors of the following sites
 - (1) Nervous system—cranium spinal cord peripheral nerves, sympathetic system
 - (2) Eye and orbit
 - (3) Bones—benign and malignant
 - (4) Lymphatic and blood forming organs—leukemia, lymphosarcoma, and Hodgkin disease
 - (5) Genitourinary tract
 - (6) Somatic structures, including the skin fat, connective tissue muscle vessels nerves, and synovia.

Other tumors such as those of the breast gastrointestinal tract and endocrine glands also occur but because of their rarity during childhood are not discussed.

The author suggests a complete examination in accordance with the following schedule: from birth to 1 year—monthly from 1 year to 6 years—quarterly from 6 years to 12 years—semiannually and from 12 years to maturity—annually (to include chest x-ray and blood study) D. W. H. L. M. D.

Jönsson, G. A New Method of Treating Capillary Hemangiomas. *Acta chir. scand.*, 94: 93-97.

Hemangiomas are benign tumors made up almost exclusively of vascular tissue which may be classified into two main groups: the capillary or telangiectatic type and the cavernous type. The latter consists of large irregularly shaped spaces generally communicating with each other and when most typical these tumors resemble normal erectile tissue.

Capillary hemangiomas are made up of a dense network of capillaries of a nearly uniform caliber with a sparse amount of interstitial tissue, and these tumors vary from pin head size to large patches some times involving an entire extremity or even one-half the body. Their color ranges from light red to dark lilac depending on the depth of the lesion below the surface the density of the capillary bed, and the amount of cavernous tissue present. The skin of the face and the neck is most commonly involved. The tumors are of congenital origin, and once developed they seldom regress. Inflammation ulceration or thrombosis occasionally occurs.

Cavernous hemangiomas can be treated with irradiation, with very satisfactory results, particularly during the first year of life. Capillary hemangioma however do not respond as well to irradiation. The numerous other methods of treatment in vogue, such as electrocautery, the application of carbon dioxide

snow and sclerification tend to leave a conspicuous cicatrix. Surgical excision of the tumors is satisfactory but often technically impossible owing to the wide extent of the capillary mass.

Jönsson describes 17 cases of capillary hemangiomas treated by an exceedingly simple method which as regards the final cosmetic result he believes is quite satisfactory. Essentially his technique consists of destroying the capillaries in the surface layers of skin by a brazen wire leaving the subcuticular tissues intact. The hemangioma is diffusely infiltrated with 1 per cent novocain and is rubbed directly with sterilized sandpaper taking care not to extend the rubbing beyond the tumor into normal skin, nor into the subcuticular tissues. Bleeding is profuse and pressure must be constantly applied during the procedure. All of the tumor may ordinarily be treated at one session. Infection must be scrupulously avoided, and the author prefers sulfathiazole ointment dressings. Complete healing occurs in about 10 days.

All cases of hemangioma are not equally well suited for this treatment, the dark red or bluish tumors respond much better than do lesions of a lighter color. Size is of no consequence but for a good result it seems necessary that the hemangioma can be emptied of blood by compression and stroking with the finger. Cavernous hemangiomas should not be treated by this method.

In a 2 year follow up, 13 of the cases showed good or completely satisfactory cosmetic results, and 4 cases showed only moderate improvement. Before and after photographs of 4 cases are included.

WYATT CAMERON, M.D.

Muskat, D. A. and Norwick, I. I. Amebic Granuloma of the Skin. *Brit J S* 77: 947-948.

Amebic granuloma of the skin, or amebiasis cutis, an uncommon lesion due to infection with the *Endamoeba histolytica*, appears in the literature because of its rarity and interesting pathological and clinical picture. The *Endamoeba histolytica* may under certain conditions, invade the skin and cause extensive ulcerative granulomatous lesions. Blood stream invasion has never been reported. The lesions arise by direct continuity via the lymphatics from some focus such as a drainage tract from the liver around a colostomy or from the rectum.

An unusual case report of amebiasis colitis of the buttocks is presented. A painful ulcerating lesion of the buttocks and posterior rectal wall was biopsied and ameba were found in the excised tissue. Because of contamination by the feces a proximal colostomy was done. The patient responded miraculously to emetine hydrochloride. Prior to the diagnosis of amebic infection the ulcerating lesion did not respond to the usual measures employed in perianal lesions. It is suggested that any acute ulcerative perianal lesion not responding to usual chemotherapeutic methods, be given a therapeutic test by emetine hydrochloride biopsy and stool examination for the *Endamoeba histolytica*. The lesion is slightly raised with steep at times undermined, edges and surrounded by an

area of induration showing all signs of inflammation. The floor of the ulcer is covered with sloughing granulation tissue and is extremely painful and tender.

JOHN E. KARABIN M.D.

Macomber W. B. and Palatta, F. V.: Malignant Tumors of the Skin in Military Personnel. *Plast Reconstr Surg* 1947 2: 234.

Two hundred patients with malignant skin tumors were seen in a military hospital plastic service during a 3 year period. Seventy-eight per cent were in the second or third decades. The face was the site of the lesion in 92 per cent.

Three types of problems were presented: (1) reconstruction of a defect made in previous excision of the tumor; (2) removal of early malignant changes resulting from incompetent x-ray therapy; and (3) removal of tumors inadequately excised or which had received various forms of inadequate treatment.

The principles advocated include: (1) wide excision of all lesions; (2) closure directly by shifting of adjacent skin flaps or with skin grafts; (3) definitive reconstruction 6 months to 1 year after excision of large highly malignant lesions (after sufficient time has elapsed to be sure there is no persistent tumor); and (4) multiple excision after application of a temporary skin graft, if the defect warrants this.

Examples of various types of lesions of the forehead, eyebrow, eyelid, cheek, nose, lip, buccal mucous membrane, and ear, with 16 photographs and 10 drawings are presented.

FRANK B. QUELIN M.D.

Hleager I., Henry S. A., Ross, P. and Winternitz, J. G.: Symposium on Industrial Skin Cancer. *Brit J Radiol* 1947 20: 145.

The mechanism of cancer production by carcinogenic hydrocarbons is completely unknown. The enormous variation in potency brought about by comparatively trivial changes in constitution suggests that a subtle and unidentified property within the molecule holds the now unknown key to carcinogenicity.

Illustrations of various sites and types of industrial skin cancer are presented together with statistical data of its incidence, the exposure period, duration and the results of treatment with roentgen rays.

FRANK B. QUELIN M.D.

GENERAL BACTERIAL, PROTOZOAN AND PARASITIC INFECTIONS

Hoffman, William S. and Volini, Italo F.: Studies in the Oral Administration of Penicillin. Assays of Various Preparations and the Determination of the Effective Therapeutic Dose. *Am J Med Sc* 1947 213: 513.

The authors point out that it is an established fact that orally administered penicillin can produce therapeutic levels in spite of the fact that a portion of the penicillin is destroyed when it comes in contact with

gastric acid. A number of oral preparations were assayed in this study to determine an effective dosage.

Estimations of plasma penicillin concentrations were made with the *Bacillus subtilis* serial dilution method of Randall, Price, and Welch as modified by Hickey. Since it has been alleged that the *Bacillus subtilis* method is of doubtful value because of the presence of inhibitors in many penicillin free blood specimens, the authors took controls both from patients before the administration of penicillin and from untreated control patients. The authors were convinced that with their use of this assay method, possibly because of their use of citrated plasma, false positives would not ruin their study.

Since there is no agreement as to what plasma penicillin levels achieve therapeutic effectiveness, the authors accepted the empirical and established finding that 20,000 units every 3 hours, when given intramuscularly, were effective in most acute infections responsive to penicillin. Such injections give plasma levels of 0.5 unit per cubic centimeter at $\frac{1}{2}$ hour, 0.06 at $2\frac{1}{2}$ hours and 0.03 at 3 hours.

A large variety of penicillin preparations were used with and without diluents, antisclerotics and buffers. On the whole, there was little difference in the statistical levels no matter which preparation was used. Crude penicillin alone in capsules produced almost the same values as did crude penicillin protected with pectin. Pure potassium penicillin gave levels not greatly different from potassium penicillin protected with a high melting fat. All forms when given in 100,000 unit doses after a priming dose of 200,000 units gave satisfactory levels for 3 or more hours.

Oral doses of 25,000 units were ineffective usually in producing appreciable plasma penicillin levels. 50,000 unit doses were also unsatisfactory.

Doses of 100,000 units when preceded by a primary dose of 200,000 units an hour earlier gave levels averaging higher than 0.125 unit per cubic centimeter for the first 2 hours and about 0.06 unit for the next 2 hours. Such levels were comparable with those obtained with intramuscular injections of 20,000 units every 3 hours. Doses of 200,000 units gave perceptible plasma levels even at 6 and 8 hours after the dose, although the levels achieved in the first hours were not significantly higher than the 100,000 units with the 200,000 unit priming doses.

From their findings the authors establish a therapeutic regimen of a primary dose of 200,000 units followed by 100,000 units of orally administered penicillin every 3 hours. This should produce therapeutic results in acute infections comparable to those resulting from the intramuscular dose of penicillin of 20,000 units every 3 hours.

W. FOSTER MONTGOMERY M.D.

SURGICAL PATHOLOGY AND DIAGNOSIS

Ellis, Frank: Needle Biopsy in the Clinical Diagnosis of Tumors. *Brit J Surg* 1947 34: 240.

The author outlines the following indications for needle biopsy: when a tumor lies deep to normal

skin or other tissues, when the possibility exists of the tumor being infected when a major operation would otherwise be necessary, and when such an operation would not allow of the successful extirpation of the tumor when the usual methods of obtaining histological evidence are contraindicated, and when excision of a lymph node is contemplated in a suspected case of Hodgkin's disease, needle biopsy may exclude cancer and may establish a diagnosis of Hodgkin's disease.

In 280 cases aspiration biopsies were carried out from the regional lymph glands, and in 87 cases from bones. The aspiration biopsy gave, on the average, about 63 per cent of useful results. In general, the type of case subjected to needle biopsy is one in which, because of lack of bed accommodation, lack of time or lack of adequate indication in the view of the clinician concerned, a biopsy would not be taken in the ordinary way. In other words, much of the evidence provided for the pathologist by needle biopsies would not be available at all if they were not done.

A drill type of biopsy is advocated for the following types of lesions:

1. Relatively superficial soft tissue lesions. These include cervical, axillary, inguinal, and other lymph nodes, breast lesions, muscle lesions, and lesions in such situations as the thyroid gland, parotid or other salivary glands, and the orbit.

2. Easily accessible bony lesions. These include lesions in all the bones except the vertebrae. The bone is inspected and carefully measured on the radiographs to determine the site of entry to be attempted by the drill aiming at an active part of the pathological process, and ease of approach.

3. The vertebrae. Obvious precautions are taken to avoid the vertebral artery in the cervical portion, the spinal cord and nerve roots. The dorsal and lumbar vertebrae are more difficult. The neural arches are easily accessible but not often affected. The bodies are deeply situated. From lateral radiographs taken with a marker on the skin in the mid

line, the depth (6 to 8 cm. usually) of the lesion from the skin can be measured. If the drill is then inserted through the skin at an equal distance from the midline at an angle of 45 degrees to the vertical with the patient lying prone, it is not difficult to strike the lesion. This procedure is best carried out under light general anesthesia and with facilities for radiographic verification of the position of the drill. Pentothal is adequate with premedication and efficient radiography. A grid used on the back for an anteroposterior radiograph with the patient supine is of aid in deciding the level at which to insert the drill through the skin.

4. Intrathoracic lesions. In a radiograph, the ribs form adequate markers for the chest, and by drawing lines from front to back it is possible to determine the direction in which the drill should be passed to the lesion.

5. Prostatic lesions. These are best dealt with in the lithotomy position. It is necessary to have the left index finger in the rectum. The needle is inserted through a small stab in the skin of the perineum, with the patient anesthetized (preferably a general anesthetic). The needle is easily felt, and can be guided into the prostate. The trocar is then removed and drilling commenced.

The author discusses at length the technique used in aspiration biopsy and drill biopsy. A review of the histological technique is also given. Many photographs showing the histological specimens from various locations are shown, which indicate the efficacy of these procedures.

The advantages of drill biopsy over aspiration biopsy are as follows:

1. The operator has greater control, not having to apply suction at the time of introducing the needle.

2. A larger piece of tissue is obtained which enables the pathologist to give a greater number of positive reports.

Both procedures may be carried out quickly, although the drill biopsy requires a more specialized apparatus.

C. FRED GOODMAN, M.D.

Fig. 7b.



Fig. 8b.



Fig. 7c.



Fig. 8c.



Fig. 3.



Fig. 5b.



Fig. 5a.



Fig.



Fig. 6a.



Fig. 6b.



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THE ROLE OF VASCULAR SPASM IN RECOVERY OF STRANGULATED INTESTINE

Experimental Study

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MANY factors are involved in the recovery of intestine of questionable viability once it has been released from strangulation. Some of these factors have been extensively investigated and will be reviewed in this report. One factor, however, which has received very little attention but which apparently is of significance in the recognition of viability and in the recoverability of strangulated intestine, is the degree of residual spasm in the involved vascular bed. It is therefore of rather fundamental importance to investigate the train of events in the intestinal vasculature following strangulation.

The present study is mainly concerned with two aspects of the problem. The first is the de-

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From the Department of Surgery Northwestern University Medical School.

Fig. 2. Appearance after release of $\frac{1}{2}$ hour arterial type strangulation showing visible reactive hyperemia and definite evidence of viability.

Fig. 3. Appearance after release of $\frac{1}{2}$ hour venous type strangulation showing irreversible hemorrhagic infarction of loop.

Fig. 5. a, Appearance of loop in a control dog 6 minutes after release of a half hour venous type strangulation. b, Appearance of loop 6 minutes after release of a half hour venous type strangulation in dog treated with papaverine 3 minutes before picture was taken.

Fig. 6. a, Appearance of loop in a control dog 6 minutes after release of 1 hour venous type strangulation. b, Appearance of loop 6 minutes after release of 1 hour venous type strangulation in dog treated with papaverine 3 minutes before picture was taken.

velopment of a method of recognizing grossly the degree of vasospasm which might serve as an index to the recoverability of strangulated intestine. The second is an evaluation of present methods of resuscitation and an investigation into additional measures which could be of practical value. The importance of recognizing viable bowel and of resuscitating a borderline case to a state of viability are too well known to require emphasis at this time.

PATHOLOGICAL PHYSIOLOGY OF INTESTINAL STRANGULATION FROM THE STANDPOINT OF THE INVOLVED VASCULATURE

Strangulation of the intestine occurs when the blood supply of a closed loop obstruction has been compromised. Hence we are dealing with the combined effects of three pathological entities: closed loop intestinal obstruction, mesenteric vascular occlusion, and simple in-

Fig. 7. a, Appearance of loop in a control dog 6 minutes after release of 1 hour venous type strangulation. Compare with Figure 6a and note how presence of luminal contents influence viability. b, Appearance of loop 6 minutes after release of 1 hour venous type strangulation in dog treated with papaverine 3 minutes before picture was taken. Compare with Figure 6b and note more questionable appearance of bowel despite treatment when lumen contains digested food.

Fig. 8. a, Appearance of loop in a control dog 6 minutes after release of a 3 hour venous type strangulation. This loop is nonviable. b, Appearance of loop 6 minutes after release of a 3 hour venous type strangulation in dog which was treated with papaverine 3 minutes before picture was taken. No change in appearance was produced. The loop is nonviable.

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terioles are almost empty and in severe spasm. The metarterioles and capillaries are in varying degrees of spasm and relaxation and the blood cells rock to and fro in some of them.

If the arterial occlusion continues, there is a gradual relaxation of the arteriolar side of the vascular bed under the influence of the local anoxia and some of the blood will settle back into the arteriolar vessels. Lewis observed this phenomenon in the upper extremity of man. If the occlusion continues long enough an equalization will finally occur in the distribution of the blood between the venous and arterial side. Grossly this is observed in the intestine under arterial strangulation by a gradual relaxation following the initial spasm pursuant to occlusion and a very slow but definite turn from a blanched, pale, rippled appearance to a more homogenous cyanotic appearance. We have observed that if the occlusion remains long enough to allow this secondary relaxation to become evident grossly the chances for recovery diminish proportionately.

If an arterial type strangulation is released while some spasm remains in the intestinal musculature the blanched, spastic bowel becomes bright red and the small tight contractions give way to larger more organized peristaltic movements, but hyperactivity of the segment persists for some time (Fig 2 frontispiece). In general the more prolonged the arterial occlusion the less pronounced will be this red response. Lewis noted this train of events in the human arm and termed the phenomenon reactive hyperemia. This has been defined as the period in which the local circulation to an organ is increased above the control resting level following the re-entry of blood into the ischemic tissue. During the period of occlusion the tissues have incurred a blood flow debt which is repaid as soon as possible after circulation is restored.

After the phase of reactive hyperemia in the intestine, there follows a secondary spasm of a mild nature which is apparently compensatory but which may be of importance in delaying eventual recovery of the bowel. If the strangulation remains until some secondary relaxation occurs the reactive hyperemia in the intestine is not so pronounced or it may be ab-

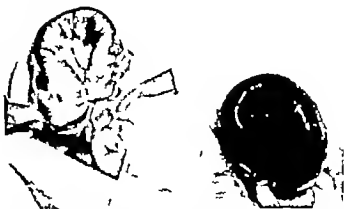


Fig 1 Arterial type strangulation left, compared with venous type strangulation after 1 hour. There has been a slight relaxation in the blanched, rippled appearance of the arterial type by now but its mesentery is still free from petechiae and the bowel is pale, whereas the venous type strangulation is distended, weeping and blood soaked.

sent. In such cases the color is violaceous due to the stagnation of blood in relaxed vessels.

The mechanism responsible for the spasm and vasorelaxation of blood vessels is as yet controversial. The spasm has been ascribed to stimulation of sympathetic fibers by the occlusive irritant while the relaxation is not dependent on the integrity of the sympathetic nerves but is apparently related to the accumulation of chemical products of tissue anoxia (17).

B Venous occlusion In a venous type strangulation we are dealing with a loop which quickly becomes engorged, edematous and blood soaked (Fig 1). Since most strangulations encountered at surgery are of the venous type and since it is a commonly acknowledged clinical fact that vasodilating measures such as warm packs do improve their appearance it would seem rather necessary that observations be made to clarify this point.

It has been shown that in the lower extremity when acute venous occlusion by a thrombus results in a damming up of blood and an increase in local venous and capillary pressure the magnitude of this alteration will be inversely proportional to the degree of available collateral circulation (31). It has been suggested (1) that the resistance (tone spasm?) in the walls of the minute vessels both on the arterial and venous sides tends to cause further decreased venous circulation. All the tissues including the capillary endothelium suffer from

anoxia, resulting in increased capillary permeability. Coincident with changes in arterial and venous portions of the system there is a diminution in the flow of lymph (31, 32).

Regarding the status of arterial blood flow in venous occlusion Abramson has summarized our present-day knowledge as follows:

Some workers have found an elevated cutaneous temperature and increased oscillometric readings while others have noted that the extremity is colder than normal. It may be that the same phase of the condition was not studied by the different authors or that the type of peripheral vascular response depends upon the magnitude and location of the site of occlusion. Other authors, notably Ochaner, are convinced that there is an unmistakable phase of arteriolar spasm following acute venous occlusions.

When binding tape is placed about a loop of intestine and its mesentery just snug enough to occlude the veins, the segment gradually becomes engorged and assumes a deep purple color. This is undoubtedly the result of damming up of blood in the veins and venules. Meanwhile, local arterial pulsations carry on in their usual manner and for a while are actually increased in intensity. This observation is in keeping with that of Lewis, who described an exaggerated pulse volume following venous congestion in the hand. Now if we allow the strangulation to continue we find that the arterial pulsations within the strangulated portion of mesentery become more feeble and as the tissue becomes more blood soaked arterial pulsations can no longer be palpated. Release of the strangulation at this point (about $\frac{1}{2}$ hour in short segments in the dog) will usually result in a resumption of the pulsations, a rapid disappearance of the deep cyanosis, and a bright red flush indicative of recovery of the bowel. Just before release capillary microscopy reveals engorged venules and quite narrowed arterioles. The capillary bed is very full, but not uniformly so. Extravasations of blood cells into the tissues are seen in every field. Variations of this condition can be seen up to about an hour of venous strangulation.

After approximately one hour of venous strangulation capillary microscopy reveals

not only the venules, but most of the capillary bed to be engorged and vessel walls are very difficult to distinguish because of the sanguineous extravasation into the tissue. The rate of blood flow through the arterioles has become markedly diminished and the blood cells travel in clumps. Minute thrombi form easily. Although the arterioles for the most part are narrower than the engorged venules there has been some relaxation by this time. As the blood is dammed up in the venous system the arterial stream becomes slowed. This process is by no means simultaneous or uniform in all areas. This secondary relaxation of the spastic arterioles in venous occlusion occurs sooner than in arterial occlusion. Nonetheless, it seems to bear the same relationship to recovery ability as in arterial occlusion. Thus the more pronounced the secondary arteriolar relaxation due to anoxia the poorer are the chances for recovery of circulation. Figure 3 frontispiece, illustrates a venous type strangulation after $2\frac{1}{2}$ hours. It is of very questionable viability.

In most instances a blood stained, plasma like transudate accumulates in the peritoneal cavity, the result of increased capillary permeability.

Arteriolar spasm in some venous strangulations may conceivably result from a tightening of the constriction due to tissue edema, finally to occlude the incarcerated arteries. In such a case we have a venous occlusion with superimposed arterial occlusion. However arteriolar spasm has been seen in pure venous occlusion without strangulation in which the main artery was free throughout the experiment.

If vasospasm occurs in the early stages of venous strangulation increasing the arterial inflow by vasodilator therapy even in the presence of already overdistended veins should be of value provided the therapy is instituted while a sufficient degree of tone remains.

In general whether the strangulation be arterial or venous the prognosis for recovery is apparently inversely proportional to the degree of secondary relaxation. In venous occlusion there is undoubtedly a changing balance between the residual tone in the smaller vessels on the one hand and the relaxation caused by anoxia or distention resulting from engorgement on the other.

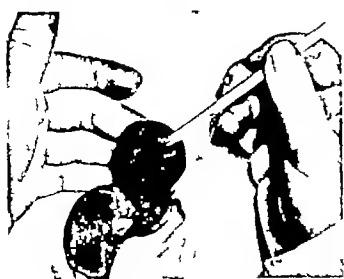


Fig. 4 a, left, Method of taking surface temperature of intestinal loop during strangulation b, Same procedure

after release of strangulation These readings are valid only when compared with similarly exposed normal bowel

EXPERIMENTAL METHODS

Experimental inquiry into the clinical application of the status of the minute vessels in strangulation requires an appropriate gross measuring device We therefore borrowed a test which has long been used in peripheral vascular disease—that of recording skin temperatures—and applied it to the serosal surface of the bowel

Ordinary mongrel dogs were starved for 24 hours and anesthetized with intravenous nembutal All strangulations were produced by placing hinding tape about a loop of ileum The strangulated segment was always about 8 centimeters (roughly 3 inches) long The venous type strangulations were made by tying the tape just tightly enough to occlude the veins to the segment but allowing arterial pulsations to come through The bowel immediately turned purple-blue then gradually distended In the arterial type strangulations the tape was tightened until no pulsations could be felt in the vasa recta We could determine the completeness of an arterial type strangulation by the blanched, rippled spastic appearance of the gut musculature In preliminary experiments we found that a segment about 3 inches long was convenient in that it showed questionable viability after approximately 1 hour for the venous type and after $2\frac{1}{2}$ hours for the arterial type After strangulation the loops were returned to the abdomen until time for recording surface temperatures

Surface temperatures were taken with an ordinary skin thermometer¹ by placing the thermometer on the lateral serosal surface of the bowel and keeping it in place until the mercury came to a standstill (Fig 4) This usually occurred after $\frac{1}{2}$ to $1\frac{1}{2}$ minutes Preliminary work indicated that variations up to 0.6 degree C may fall within experimental error but after repeated performances this error could be reduced almost to zero Since the intestinal surface temperature is influenced by the temperature and humidity of the air a control reading of neighboring normal bowel similarly exposed was always made just before that of the involved segment Ideally surface temperatures should be taken on dry surfaces When two points are being compared however it is more important that both should be exposed to the same conditions To equalize the variables associated with loss of heat by evaporation readings were always taken when the bowel was moist In this way the difference in the degree of evaporation heat loss between the control and the involved loops was brought within satisfactory limits for our purposes The bowel was always held in the same manner to equalize errors induced by conduction Thus by subjecting the normal control bowel and the involved loop to the same errors of heat loss through vaporization radiation convection and conduction our readings

Both the Becton Dickinson and Raueher Betrolid skin thermometers were used.

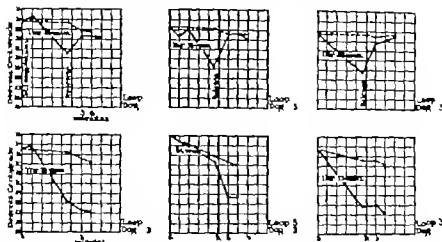


Chart 1. Temperature curves in viable venous type strangulations, above, compared with those in nonviable strangulations of the same type, below. Temperature of strangulated loop shown by solid line; control by interrupted line. S. Strangulation. R. release. Note that the duration of strangulation varies with each segment and although important within limits, does not alone determine the type of temperature response, because of the many other factors involved. These graphs indicate that if the temperature response following the release of strangulation is poor or negative the viability of the loop is very doubtful.

could be interpreted as being accurate on a comparative basis between the two points. It was not necessary to obtain absolute readings by calculation or to use an electrical thermocouple.

INTESTINAL SURFACE TEMPERATURE IN VENOUS TYPE STRANGULATIONS

Temperature readings were made before and after release in 28 venous type strangulations. Typical curves of the surface temperature are portrayed in Chart 1. Shortly after strangulation the temperature of the loop rose slightly above that of the neighboring normal bowel in some instances. This undoubtedly was the result of initial engorgement. After 45 to 90 minutes of strangulation the temperature of the loop dropped from 1 to 5 degrees centigrade. Upon release of the strangulation we were interested in determining whether the behavior of the surface temperature was an indication as to whether or not the segment would survive. Three minutes were allowed to elapse between the time of release and the next reading and an equal time interval between subsequent readings. We found that in the viable segments there was a slow rise in temperature sometimes finally reaching that of the neighboring normal bowel other times not quite

equalling the control reading. In nonviable segments the temperature either remained at its strangulation temperature or actually declined. No resuscitative therapy was used in these animals. Our predictions were checked by postmortem examinations when necessary.

INTESTINAL SURFACE TEMPERATURE IN ARTERIAL TYPE STRANGULATIONS

Temperature readings in 20 arterial type strangulations showed a rather different response than did the venous types. The temperature began to drop almost immediately, first slowly then more rapidly. As shown in Chart 2 temperatures dropped as much as 6 degrees after arterial occlusion. However if the strangulation was released before the phase of secondary relaxation—that is, up to about 2½ hours for the length segment we were using the temperature bounced up to above that of the neighboring normal bowel. This rebound or reactive hyperemia was never observed in venous type occlusions.

If the strangulation was allowed to remain until after secondary relaxation of the intestinal musculature, reactive hyperemia did not occur and the temperature stayed at its strangulation level. Such segments were always nonviable.

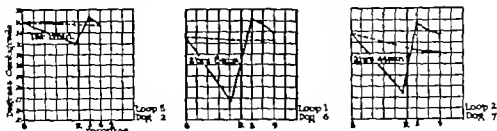


Chart 2 Temperature curves in viable arterial type strangulations showing the phenomenon of reactive hyperemia as it reflects in the temperature response following release. If an arterial type strangulation is nonviable, its temperature curve is no different from that of a nonviable venous type as shown in Chart 1

METHODS OF RECOGNITION AND REVIVAL OF BORDERLINE CASES OF INTESTINAL VIABILITY

Oftentimes recognition of viability may prove fallacious even by surgeons of the widest experience. The tests for viability in use today include (1) the return of pulsations to the segment (2) the return of the pink color of viability (3) the return of peristaltic movement (4) the fluorescein test. Although all these tests are of value, they have certain limitations.

The return of pulsations may not always be an indication of viability. Pulsations may not be palpable yet the segment may live. Pulsations are known to be transmitted through thrombotic vessels. Furthermore, in venous occlusions with irreversible changes in the bowel the return of pulsations may be misleading.

The return of color resembling that of viability is not always useful as a test since many segments with an ominous deep purple hue are known to survive. However when the blush of viability does return it is a fairly reliable criterion.

The return of peristalsis is a poor prognostic criterion of viability since we know that anoxic intestine may be very active for a while. This anoxic spasm may be erroneously interpreted as active peristalsis.

The fluorescein test first employed by Lange and Boyd in 1942 is probably the best test of viability we have to date. It is unquestionably accurate (15) but has its drawbacks. We think it a fair assumption that most surgeons would rather go ahead and resect a questionable segment of bowel than darken the operating room use a special ultraviolet lamp with a Wood filter and inject a solution of fluorescein and sodium bicarbonate intravenously into the patient.

Recent developments in isotopic tracer substances fire the imagination with possibilities of using them in determining viability of bowel. The lead encasements Geiger counters and other necessary paraphernalia might make the method cumbersome however.

Thus there is need for a simpler more direct less cumbersome test for viability of the intestine.

As a rule tests for viability are employed after various therapeutic measures have been tried to revive the questionable bowel. Therapeutic approaches to the revival of bowel just released from strangulation can be listed as follows: (1) the application of hot packs to the bowel (2) inhalation of pure oxygen (3) injections of procaine hydrochloride into the mesentery near the vessels of the segment (4) the use of heparin to prevent propagation of thrombi and to decrease the viscosity of the blood. Each of these measures carries its own drawbacks.

Hot packs may not only damage the serosal surface and thus lead to adhesions but they actually enhance thrombosis in the superficial mesenteric veins close to the segment. However it is well known that mild heat acts as an active vasodilator. Temperatures above 34 degrees C usually exceed that of normal exposed bowel and can therefore be termed warm. Lewis has shown that temperatures of over 47 degrees C may cause tissue damage and even thrombosis.

The inhalation of oxygen for purposes of enhancing the recovery of strangulated bowel was introduced by Chase some 20 years ago. It is true that circulating blood takes on a bright red color after oxygen inhalation and therefore any normal tissue it traverses is similarly affected. However there is no physio-

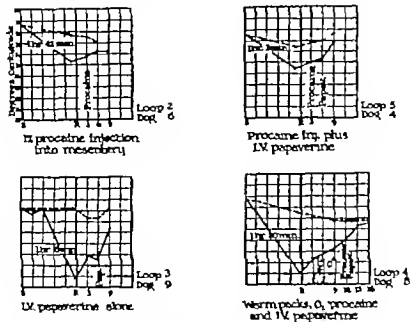


Chart 4. Further comparison of typical temperature curves following various forms of resuscitative therapy. The combined effect of all four therapeutic measures is apparently of greatest value.

by experiment. Some of the evidence on the beneficial effects of this drug in peripheral vascular disease has been equivocal and in several reports it has been shown to be of no value (34). Apparently the nature of the local pathology and the degree of tone remaining in the blood vessels has much to do with the success or failure of the drug. Furthermore dosages have never been uniform and its action is relatively short lived. Experimental studies on the value of papaverine in the resuscitation of strangulated bowel have not been previously reported to our knowledge.

In preliminary experiments we tested the effects of papaverine by responses in the gross color of strangulated loops. Next, we employed surface temperature readings as a more refined test of its efficacy. Finally the effect of papaverine was studied in comparison with that of well known measures now in use, in order to determine a means of obtaining the maximal response to therapy.

PRELIMINARY EXPERIMENTS ON THE EFFECT OF PAPAVERINE HYDROCHLORIDE ON THE GROSS APPEARANCE OF STRANGULATED INTESTINE

In order to eliminate the question of subjective impressions of color change, color pho-

tography was employed. In each experiment two dogs of about equal weight (7 kilos) were anesthetized with intravenous nembutal after a 24 hour starvation period. Every attempt was made to produce precisely the same type of strangulation in each of the 2 dogs. Venous type strangulations were made with binding tape for equal periods of time before release. Among the variables which required standardization were the tightness of the strangulating tape and the anatomical location of the loop. Even in dogs starved for 24 hours the amount of intestinal contents may vary. To obviate this variable, only those segments which upon release appeared identical to their control counterparts were used for testing the effects of papaverine.

Two speed graphic cameras with identical lens corrections were set up under identical lighting conditions and identical exposure factors. One dog served as a control and received no therapy after the strangulations were released while the other dog received a slow injection of $\frac{1}{2}$ grain¹ of papaverine hydrochloride.

¹A 1 cubic centimeter ampul of papaverine contains $\frac{1}{2}$ gr. (0.033 gm.) of active principle. This is a relatively large dose, equivalent to 0.045 gm. per kilogram. Blood pressure studies in previous experiments using this dose revealed a transient (2-minute) drop in blood pressure and a fleeting stimulation of expiration from which all dogs recovered with no ill effects. We found that papaverine had a negligible effect on intestinal motility.

ride into the femoral vein 3 minutes after the release of each segment. The strangulations were released at $\frac{1}{2}$ hour intervals, from $\frac{1}{2}$ to 3 hours after initial strangulation. Photographs were taken of the released loop in each dog 3 minutes after papaverine was injected (Figs. 5 6 7 frontispiece).

The photographs gave us the impression that papaverine definitely improved the color response of the bowel following strangulation up to about $1\frac{1}{2}$ hours of strangulation. It must be remembered that in longer loops the time factor is considerably lengthened. After 2 hours of venous type strangulation no recovery could be seen in either treated or control loops (Fig. 8 frontispiece). Three inch loops in dogs subjected to venous type strangulations for more than $1\frac{1}{2}$ hours are usually beyond recovery under any circumstances.

SURFACE TEMPERATURE CHANGES IN INTESTINAL LOOPS OF QUESTIONABLE VIABILITY FOLLOWING PAPAVERINE HYDROCHLORIDE AND OTHER RESUSCITATIVE MEASURES

Strangulations of both the venous and arterial types were produced in the manner mentioned previously. The strangulations were left in place for varying periods of time until the loop reached a stage of questionable viability. Surface temperatures were recorded while the strangulation was still in place and compared with a control reading of normal bowel. After release of the strangulation temperatures were again taken following a lapse of 3 minutes. One group was treated with hot packs for 3 minutes, a second group received an injection of novocain perivascularly into the mesentery, a third group was given inhalations of pure oxygen, and a fourth group received 1 cubic centimeter of papaverine hydrochloride in a peripheral vein by slow injection. The effect of these procedures and various combinations of them on surface temperature was observed. A prediction was made in each case as to the viability of the segment and its accuracy checked by autopsy examination.

COMPARATIVE ANALYSIS OF METHODS OF RESUSCITATION OF STRANGULATED INTESTINE

The number of strangulated loops subjected to the various forms of therapy is small since

we chose only those of very questionable viability. Such a study contains many variables and is rather difficult to control for purposes of accurate quantitative comparison. Thus, we were satisfied to determine in a qualitative manner whether a given therapeutic measure caused a favorable response or not.

After the strangulation was released for 3 minutes and the temperature recorded, treatment was instituted and temperatures checked at 3 minute intervals up to 36 minutes in some instances. The forms of treatment included warm packs locally, papaverine hydrochloride intravenously, procaine hydrochloride injections into the mesentery, oxygen inhalations, and various combinations of these measures. Typical temperature responses are shown in Charts 3 and 4.

We found that in most instances, each of these measures has some merit, and there is no reason why all of them should not be employed. However their effects are not necessarily mathematically cumulative.

VALUE OF PAPAVERINE AS AN ADJUNCTIVE FORM OF THERAPY

In general, we found that the most consistent rises in temperature resulted when papaverine hydrochloride was used in addition to one or several of the other resuscitative measures. For example, when warm packs were applied to the segment after its temperature stabilized there resulted a temporary rise. Three minutes later however there was a decline in temperature. If then papaverine was injected, the temperature rose and held a more or less constant level. Such a loop was considered viable. If the papaverine gave little or no response, the loop was declared nonviable.

Oxygen inhalations alone gave only a moderate response in temperature in 12 loops. Although the color seemed to improve in some cases, it by no means did so in every instance. If the segment was still viable, the intravenous injection of papaverine even 30 minutes after the inhalation of oxygen resulted in a substantial rise in temperature, often equalling that of the adjacent normal bowel.

Perivascular injections of procaine hydrochloride into the mesentery were made in 7 instances. They produced little or no response

when used alone, but when papaverine was injected intravenously the rise in temperature was definite provided the loop was recoverable. We could not determine whether this was the combined effect or the effect of papaverine alone since the response to papaverine varied from case to case.

When papaverine alone was used the temperature of the loop if it was recoverable, rose in each of 15 instances. However in several instances the temperature could be boosted further by adding another measure, such as warm packs. We did not administer the drug postoperatively in any of our animals although this might be advisable clinically.

ACCURACY OF SURFACE TEMPERATURE AS A TEST OF VIABILITY

Our predictions of viability based solely on surface temperature responses in over 50 strangulations were correct in every instance but two. These two segments each in a different animal, were found intussuscepted at post mortem. Our presumption was that after regaining viability they were restrangled by intussusception after the abdomen was closed and had they not intussuscepted they would have survived. We therefore thought of the test as one which might be of some clinical value.

SUMMARY AND CONCLUSIONS

The recovery of strangulated intestine has been investigated from the standpoint of the behavior of the involved vasculature. Evidence obtained by intestinal surface temperature readings indicates that there is considerable residual vasospasm in the minute vessels of a still viable loop. Of the many factors which affect the recoverability of strangulated intestine vasospasm is of no small significance whether the strangulation be primarily arterial or venous.

The gross appearance of a still viable arterial type strangulation is markedly different from that of a still viable venous type strangulation. By the time an arterial strangulation assumes the gross appearance of a venous type, its vasculature has lost all reactivity and is beyond recovery. However an arterial type strangulation retains recoverability more than 5 times as long as does the venous type.

Release of a viable arterial type strangulation results in reactive hyperemia followed by a phase of vasospasm, as demonstrated by intestinal surface temperature readings. Release of a viable venous type strangulation is followed by a slow rise in temperature to the control level or not quite reaching it. This latter phenomenon might conceivably be due to the following acting separately or in combination: (1) the necessity of the renewed blood flow to move the stagnant venous blood through engorged veins (2) the formation of thrombi causing a rerouting of circulating blood through fewer channels (3) arteriolar spasm due to secondary arterial occlusion which may follow venous occlusion (4) reflex arteriolar spasm following pure venous occlusion.

In nonviable segments of either type release of the strangulation results in a poor temperature response or an actual decline in temperature. As secondary relaxation of the vasculature progresses during strangulation there is a loss in reactivity to resuscitative measures.

The response of intestinal surface temperature to the various forms of resuscitative therapy is offered as a simple test for viability which may have some clinical application. The rise in temperature of the affected loop as compared to normal bowel is an indication as to its recoverability.

Papaverine hydrochloride is of value in relieving residual vasospasm thus aiding the recovery of bowel following strangulation provided the loop is recoverable. Comparative studies between the effects of warm packs oxygen inhalations mesenteric novocain injections and the intravenous administration of papaverine were attempted. All these measures were found to have some value in increasing the blood flow through a still viable loop of intestine. When papaverine in large doses was given following one or a combination of the first three measures an additional response was usually seen.

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SURGICAL TREATMENT FOR SYMPTOMS PRODUCED BY CERVICAL RIBS AND THE SCALENUS ANTICUS MUSCLE

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TWENTY TWO years of experience in the treatment of symptoms produced by cervical ribs and the scalenus anticus muscle have revealed many interesting facts. Section of the scalenus anticus muscle which I suggested and reported on in 1927 instead of removal of the supernumerary rib continues to be the operation of choice (1 2) Occasionally a portion of a completely formed cervical rib has to be cut away with rongeurs to mobilize thoroughly and relieve all irritation on the brachial plexus, in addition to sectioning of the distal end of the scalenus anticus muscle. Cervicothoracic sympathectomy occasionally has to be performed in conjunction with scalenotomy when vascular and vasomotor symptoms predominate. An anomalous formation of the first rib with the presence of a cervical rib requires resection to liberate thoroughly the brachial plexus.

THE VASCULAR TEST

I should like to re-emphasize the importance of the vascular test (3) a maneuver to which other authors have attached my name. The test indicates whether or not the volume of the pulse has been altered suggesting that the subclavian artery has or has not been compressed. If the subclavian artery has been compressed there is a strong supposition that the brachial plexus also is irritated whenever the scalenus anticus muscle is placed on tension the artery being displaced posteriorly against trunks of the plexus. The test consists of having the patient take a long breath elevate his chin and turn it to the affected side (Fig 1a and b Fig 2a and b) This is done as the patient is seated upright, with his arms resting on his knees. An alteration or obliteration of the radial pulse or change in blood pressure is a pathognomonic sign of a scalenus anticus syndrome. Since I called attention to

this phenomenon in 1927 it has been too often overlooked in a surgeon's desire to operate for pain in the shoulder and arm supposedly due to the syndrome

It has been my experience that little has been accomplished by the scalenotomy procedure for the scalenus anticus syndrome without the presence of cervical ribs or unusually large transverse cervical processes unless the result of the vascular test is positive. The test for muscle tenderness and nerve block advocated by Ochsner Gage and DeBakey apparently has proved extremely valuable in the selection of patients for surgery when a syndrome of scalenus anticus is considered.

The vascular test has other diagnostic values such as determination of the presence or absence of subclavian arterial constriction without symptoms when cervical ribs are identified roentgenologically by accident. If the result of the test is negative surgical treatment is not indicated and the patient should not be told of the finding. If the result of the test is positive, surgery has to be considered then or later depending on how much constriction has taken place. If the radial pulse can be obliterated scalenotomy should be performed at once, since I have observed on several occasions atheromatous thickening in the wall of the subclavian artery under the scalenus muscle where friction existed. In 2 patients of mine the artery ruptured at the site of the atheromatous patch after scalenotomy. In one patient, it occurred 12 days after surgery. The hemorrhage was so extensive that the patient died before I could bring him back to the operating room and ligate the subclavian artery. In the second case it occurred just as I had finished the operation. I promptly exposed and ligated the proximal end of the artery. The entire wall of the vessel was brittle in that portion of the subclavian artery that lies posterior to the scalenus anticus muscle. Fortunately the patient recovered without

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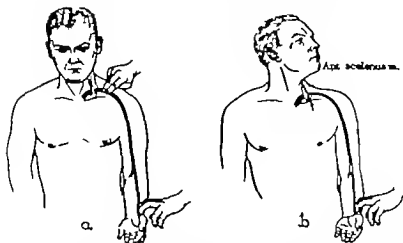


Fig. The vascular test a, the subclavian and radial arteries identified, b, pulsations of arteries obliterated by inspiration, elevation of patient's chest and rotation of his head to the affected side. In this case, the left.

complications, and was also relieved of symptoms.

TAUT OMOHYOID MUSCLE

The omohyoid muscle in people with long necks not infrequently compresses the brachial plexus and gives rise to paresthesias. Although this muscle usually is divided during the operation I have purposely left the ends unsutured in several cases. I have done this after an experience with a patient who had undergone scalenotomy elsewhere for the syndrome this patient also had a small cervical rib. Not being sure that the scalenus anticus muscle had been completely divided, I advised reoperation. I found everything to be satisfactory except that the omohyoid muscle was very tense and acted as a band running diagonally across the brachial plexus. I divided the muscle and closed the wound. The patient was relieved of her symptoms of paresthesia of the lower arm and hand.

DEVELOPMENT OF SUPERNUMERARY RIBS

Jones attributed the embryologic formation of supernumerary ribs to a conflict between forming plexuses and ribs. In higher forms, the limb buds cover several vertebral segments, the nerves from which grow into the buds. However the diametric growth of the limb buds does not keep pace with the longitudinal growth of the vertebral column and soon segmental nerves have to pursue an

oblique course to enter the buds. Then begins the conflict between the obliquely running nerves and the newly forming ribs. The embryonic nerve trunks are far larger in proportion to the vertebrae and ribs in the embryo than in the fully developed animal. The obliquely running nerves normally impede the growth of the ribs, so discouraging them that they merely form vertebral processes. Todd was of the opinion that the vessels have equal importance with the nerves as causative factors in modification of the upper end of the thorax.

The reported anomalies of the upper end of the thorax run from rudimentary first ribs to double cervical ribs on the same side (5 24 25).

Gruber in 1869 classified cervical ribs. He divided them into four groups according to extent of growth (Figs. 3 and 4) (1) a rib of slight degree reaching beyond the transverse process (2) a more advanced rib reaching beyond the transverse process, either with a free end or touching the first rib (3) an almost complete rib the connection with the cartilage of the first rib being formed by means of a distinct band or by the end of the long body of the cervical rib and (4) a complete rib possessed of a true cartilage which unites with the cartilage of the first rib (Fig. 5).

The surgical anatomy of cervical rib is essentially that of the posterior triangle of the

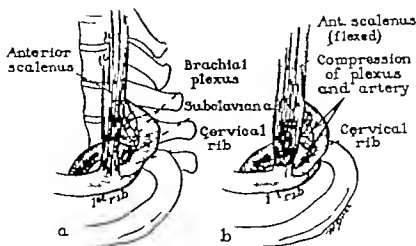


Fig. 2. The vascular test, a, appearance of the anatomic structures when the scalenus anticus muscle is relaxed; b, constriction of the subclavian artery and brachial plexus when the scalenus anticus muscle is contracted.

neck. The posterior triangle curves obliquely around the lateral aspect of the neck. It is bound in front by the sternomastoid, behind by the trapezius, while its base is formed by the middle third of the clavicle. Its floor is formed from above downward by the splenius capitis, levator scapulae, scalenus medius, and posticus muscles, the first rib and the first digitation of the serratus magnus. The scalenus anticus muscle does not form a part of the posterior triangle since it is directly behind the clavicular portion of the sternomastoid muscle (31).

Todd (47-49) believed that the scalenus and intercostal muscles arise from the same muscle plane, forming two sheets, the outer forming the scalenus anticus and minimus muscles, the inner the scalenus medius and posticus muscles. These sheets of muscles are continued as the internal and external intercostal muscles. The subdivisions of the scalenus muscles are made by the passage of vessels and nerves. The course of the subclavian artery through the scalenus muscles corresponds to that of an intercostal artery through the wall of the thorax.

The contents of the posterior triangle are (1) arteries—the third part of the subclavian, the transverse cervical and suprascapular; (2) veins—the subclavian and external jugular; and (3) nerves—the brachial plexus.

The subclavian artery is divided into three parts by the scalenus anticus muscle. The

first part is medial to the muscle, the second part directly behind and the third part is lateral. The subclavian vein is below and in front of its artery with the scalenus anticus muscle lying between. The phrenic nerve passes downward in front of the scalenus anticus muscle toward the medial border. The cervical pleura is directly below and behind the first and second parts of the subclavian artery. It extends higher in the neck in the case of persons with cervical rib. An important relationship to the first part of the subclavian artery on the left side is the thoracic duct which arches down in front of it in order to end at the junction of the internal jugular and subclavian veins. The first rib is below the third part of the subclavian artery.

INCIDENCE OF SUPERNUMERARY RIBS

To determine the incidence of cervical ribs, a study was made of roentgenologic findings in a complete series of patients registered at the Mayo Clinic between given dates. The study was made before 1927 when fewer roentgenograms were made of the cervicothoracic portion of the spinal column than are made today. The study showed that 303 patients had cervical ribs, an incidence of 0.0563 per cent, or 5.6 patients per thousand. Of these 303 patients, 84 were males and 219 were females. Roentgen-ray examination revealed bilateral cervical ribs in 143, a cervical rib on the right side in 70 and a cervical rib on the left side in

90 cases. In cases of unilateral cervical rib there frequently existed on the opposite side a supernumerary costal tubercle which did not extend beyond the transverse process of the cervical vertebra and was, therefore, not classified as a cervical rib. It might easily have been placed in Gruber's first class. In 167 cases of the group of 303 the presence of cervical ribs was discovered accidentally because there were no symptoms (19). Thus, 55 per cent of the patients were symptom free. Of the remaining 136 patients, only 36 were operated on before 1928 (23) among the others the symptoms were mild or too indefinite to justify surgical treatment. However in view of the added information now obtainable by the vascular test and in view of the observations I have made while performing scalenotomy subsequently I suspect that a larger percentage of patients should have had surgical treatment.

White and associates, in a study of congenital malformations of the first thoracic rib revealed some interesting data concerning the incidence of malformations and the similarity between the symptoms of malformations and those resulting from cervical ribs. He quoted Haven, who reviewed 5 000 routine roentgenograms of the thorax in which he found 38 abnormalities of the first thoracic ribs as compared with 37 cervical ribs. His findings of cervical ribs represented an incidence of 0.074 per cent or 7.4 persons with cervical ribs per 1 000 (7, 9, 13, 40). These figures slightly exceeded ours.

ETIOLOGIC FACTORS

Authors attempting to explain the mechanism responsible for the symptoms associated with cervical ribs or for the symptoms developing without the presence of cervical ribs have contributed numerous reports of cases, with peculiarities in this or that case.

There are several factors that play important roles in the production of the symptoms. Probably no one factor is responsible for all the symptoms, although some are more responsible than others. It is difficult to explain why all patients with completely formed cervical ribs do not have symptoms. It is just as difficult to explain why symptoms develop

in so few of these cases when it is considered that the shoulder girdle has a tendency to descend as all people become older. There must be a good reason why the symptoms develop in early adult life and rarely in childhood. It is not so difficult to understand why vascular phenomena and vasomotor disturbances arise, other than the fusiform aneurysm which only rarely develops in the third portion of the subclavian artery lateral to the outer border of the scalenus anticus muscle.

I believe there are three factors responsible for the symptoms, with the scalenus anticus muscle being the chief one. The first factor is that those persons in whom symptoms develop have an anatomic structure of the neck which is different from that of normal persons. The cervical portion of the spinal column is longer and this same congenital defect accounts for the high-lying second division of the subclavian artery. The base of the posterior cervical triangle which runs parallel with the superior border of the clavicle is shortened. The width of the base, and the distance between the posterior surfaces, of the scalenus anticus and the scalenus medius and posticus muscles likewise are congenitally shorter or perhaps it should be called lower so that the space through which the subclavian artery and the cords of the brachial plexus must pass is decreased. Then, if there is present a cervical rib or a large cervical transverse vertebral process, the structures passing through the base of the triangle are still further compressed, since the bony structures elevate the floor and displace the plexus forward against the subclavian artery. The subclavian artery is unable to dislodge itself and, therefore, is caught, compressed, and limited between the brachial plexus from behind and the scalenus anticus muscle in front.

I have also observed that in cases in which circulatory disturbances and brachial symptoms are associated and are severe, the insertion of the scalenus anticus muscle invariably is wide, the muscle being reflected laterally beyond the operculum of the first rib. This narrows the space between the lateral border of the scalenus anticus muscle and the cervical rib and accounts for additional compression of the brachial plexus and the subclavian artery.

The second factor which is concerned more with the onset of symptoms probably is associated with the descent of the shoulder girdle (6). This process begins in early adult life. The descent or sagging of the shoulders possibly could add sufficient traction on the brachial cords to precipitate symptoms when the congenital abnormality of the lower part of the neck had already reduced the normal freedom of movement.

I wish to report a number of observations to support my opinion that the scalenus anticus muscle the third and chief factor was the one chiefly responsible for the symptoms (in 37-42).

My attention was called to the possible rôle the scalenus anticus muscle played in the cervical rib syndrome on June 13, 1925 when I was asked to examine a patient who had gangrene of the first and second fingers of his right hand. It was known that he had a cervical rib on the right side but we were unable to explain the unilateral vascular changes in the fingers. The brachial radial, and ulnar arteries had no pulsations. The right hand and lower part of the arm were cyanotic, cold and moist. In view of my interest in vasomotor disturbances, I advised surgical exploration of the cervical rib. This was done. I used the anterior approach that I still use—the one in which the base of the posterior cervical triangle is explored through a unilateral collar skin incision. After reflecting the clavicular portion of the sternocleidomastoid muscle I exposed the scalenus anticus muscle.



Fig. 3. A completely formed right cervical rib which is producing symptoms, and an incompletely formed cervical rib on the left which is not producing symptoms.

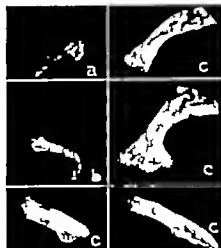


Fig. 4. Surgical specimens of cervical ribs, illustrating the different sizes and shapes under Gruber's classification: a, group 2; b, group 3; c, group 4.

The muscle was in my way as I explored the cervical rib so I proceeded to section the costal attachment. I noticed that with each inspiration of the patient the scalenus anticus muscle bulged and became tense and completely collapsed the subclavian artery. After I had divided the muscle there remained an indentation where the muscle had rubbed the artery. This indented portion of the artery was shell like to palpation for a calcareous atheroma had developed there. The vessel did not give way at the site of this atheroma, as it did in the 2 other cases to which I have referred.

After sectioning the scalenus anticus muscle I continued the dissection. I was impressed by the damage that had been done to the artery. When the artery was released from the pressure of the muscle it began to slip back into the thorax and as it did so it released the brachial plexus. Hence the brachial plexus no longer was jammed over against the cervical rib. It was apparent that removal of the cervical rib would have been insufficient to relieve the constriction of the subclavian artery. It likewise was apparent that sectioning of the scalenus anticus muscle which promptly contracted upward relieved the situation and would have done so without removal of the cervical rib. However I proceeded to remove the cervical rib by the anterior approach, since in all surgical teaching up to that time removal of cervical ribs had been the practice advocated.

After having several similar experiences, I became convinced that it was not necessary to remove cervical ribs routinely and that the chief etiologic element was the scalenus anticus muscle. This point was further substantiated by experience with the vascular test. During the operation I could increase the tension on the scalenus anticus muscle by having the anesthetist elevate the patient's chin and rotate the head to the affected side. The increased tension increased the pressure and further collapsed the subclavian artery with each inspiration. It was also observed in employment of the test preoperatively that the more completely the circulation was obliterated at the wrist the greater was the evidence of arterial compression when the subclavian artery was exposed during the operative procedure.

The explanations vary somewhat as to why the symptoms begin in early adult life. Descent of the shoulder girdle may be one of the contributing factors. I have always held that this process occurred at the height of muscular development which would explain the hypertrophy of the scalenus anticus muscle. Although both of these factors—descent of the shoulder girdle and hypertrophy of the scalenus anticus muscle—may contribute to the mechanism, I have never been called on to operate on athletes, wrestlers, boxers or football players with marked muscular hypertrophy or with heavy descending shoulders. Perhaps the person who has these congenital anomalies learned early in life that it was painful to pursue vigorous activity and therefore avoided athletics.

We still have failed to explain why the scalenus anticus muscle has hypertrophied in so many cases. It is possible that the muscle, with other accessory respiratory muscles, is called on to lift a heavier load during respiration in adult persons than in children because the shoulders and pectoral girdle have increased in weight.

I believe the scalenus anticus syndrome which develops with or without cervical ribs results from a combination of factors. First, the congenital anomaly restricts the activity and freedom of movement of the brachial plexus and the subclavian artery. As long as

no activating factor is introduced, the artery may be compressed slightly with each inspiration without the production of symptoms. But as the load on the scalenus anticus muscle is increased the artery is compressed and displaced backward, jamming the plexus against the floor of the cervical rib or the transverse process of the cervical vertebra. All this varies in degree depending on the room within the base of the posterior triangle of the neck. The neurologic symptoms depend on the nerve trunk involved and the degree of pressure applied. The atheromatous changes of the subclavian artery with resulting thrombosis and occlusion no doubt are due to local damage and a liberated embolus. The degree of damage bears a direct relationship to the trauma. The presence of adhesions about the subclavian artery suggests thrombosis of the vasa vasorum and an inflammatory reaction. The tenderness of the scalenus anticus muscle that Gage has brought to our attention probably is caused by thrombosis of arterioles from pressure trauma within the muscle. It undoubtedly gives rise to a local inflammatory process and sensations of pain which Gage said he could temporarily relieve with a local anesthetic agent.

The vasomotor phenomenon results from stimulation of the fibers as they pass, intermingled with the myelinated nerve fibers of the brachial trunks. In the patients who present an unusual vasomotor disturbance the sympathetic nerve distribution probably is as Telford and Stopford suggest. They in reviewing a number of dissecting room subjects without cervical rib found that the lower trunk of the brachial plexus in 8 cadavers lay on the upper surface of the first rib. In the eighth cadaver they found that in the inferior part of the lower trunk of the brachial plexus there was a distinct and separate bunch of unmyelinated fibers which they interpreted as being sympathetic fibers passing to the upper limb by the way of the lower trunk and which had not yet become incorporated with and intermingled among the other fibers of the lower trunk. The fusion of the sympathetic fibers with the lower trunk was, in this instance, at a more distal point than usual. It is my impression that a similar situation occurs now and

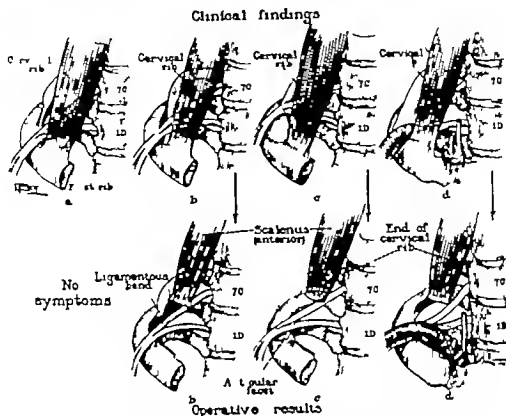


Fig. 5. a, A cervical rib with a fibrous band between the cervical rib and the thoracic rib; such a cervical rib does not produce symptoms because there is ample space between the lateral border of the scalenus anticus muscle and the ligamentous band of the cervical rib; b, compression of the lower trunk of the brachial plexus by pressure of the scalenus anticus muscle against the fibrous band; c, relief of compression obtained by tenotomy of the scalenus anticus muscle and division of the fibrous band; d, compression of the lower trunk of the brachial plexus by pressure of the scalenus anticus muscle against the completely formed cervical rib; e, relief of compression obtained by either tenotomy of the muscle or resection of the rib; d, compression of the lower trunk of the brachial plexus and the subclavian artery against the completely formed cervical rib; d, relief of compression achieved by tenotomy of the scalenus anticus muscle or by resection of the cervical rib.

then when cervical ribs are present because the vasomotor symptoms of vasospasm and hyperhidrosis predominate and are out of proportion to other neurologic findings, so that major involvement of postganglionic sympathetic fibers is suggested.

Telford and Stopfard (44) further wrote that in the presence of a cervical rib the cervical sympathetic fibers are more likely to be irritated than would be true if the rib were not present. This point is substantiated in that the vasomotor phenomena are less marked in the scalenus anticus syndrome when cervical ribs are absent than when they are present.

In discussing the influence of irritation of the sympathetic nerves Telford and Stopford said it is their opinion that the irritation produces enough spasm of the vasa vasorum to

result in constriction and obliteration of the vessels, with resulting nutritional changes in the larger arterial walls which ultimately might lead to thrombosis. I presume it is possible that this process of thrombosis of the vasa vasorum and impairment of the arterial wall may account for the development of the fusiform aneurysm in the third portion of the subclavian artery lateral to the scalenus anticus muscle. It is a common occurrence to see that the third portion of the subclavian artery is much larger in diameter than the first portion which is medial to the scalenus anticus muscle. I have always attributed this to paralysis of the vasomotor fibers supplying the third portion of the subclavian artery.

Before proceeding with an enumeration of the symptoms produced by the factors re-

TABLE I.—INCIDENCE ACCORDING TO AGE 142 PATIENTS WITH SYMPTOMS OF CERVICAL RIB OR THE SCALENUS ANTICUS SYNDROME

Age range*	Group			Totals
	A	B	C	
15 to 20	3			3
20 to 25	3		3	6
25 to 30	8	7	18	33
30 to 35	7	5		12
35 to 40			5	5
40 to 60				
6				
Totals	21	12	23	56

*15 to 20 years, 20 to 25 years, 25 to 30 years, 30 to 35 years, 35 to 40 years, 40 to 60 years.
 †The age of the patient at the time of onset of symptoms could not be ascertained in all cases.

responsible for the scalenus anticus syndrome, I should like to present a word of caution and suggest that clinicians and surgeons consider other causes for pain in the shoulders, arms, and neck. I agree with Ochsner and associates, Eaton and McGowan who have emphasized that numerous conditions may produce pains about the shoulders, neck, arms, and hands. The more common ones are bursitis, cervical arthritis, myositis, fibrositis, brachial neuritis, Raynaud's disease, thromboangiitis, neoplasms within the spinal canal, neoplasms of the peripheral nerves and protruded intervertebral disks. In addition to all these, there are added the functional elements—exemplified by the patient who complains of pain here and there which includes the shoulders, neck, head and even the arms at some time or other. I presume that it is needless to emphasize the importance of a careful study and an accurate differential diagnosis. It is certain that scalenotomy will not relieve the symptoms which are produced by the lesions just mentioned.

SYMPTOMS

The symptoms vary according to the structure chiefly involved (45, 46, 50, 51, 53). Pain is the most common symptom. Often a pulsating mass can be detected above the clavicle; a bruit may be elicited in the same area. Paresthesia and anesthesia are not uncommon. Paralysis occurs less frequently, as does gangrene of the finger tips. Symptoms of vaso-

motor disturbances appear rather frequently. One hand is cooler, more sweaty and dusky, although not truly cyanotic, than the other hand when the condition is unilateral (22, 35).

Onset of symptoms. Cervical ribs have been recognized in children (41) by the presence of a tumor in the neck. Murphy and Donaldson thought the most common age of the patient was from 12 to 18 years. Beck thought the symptoms were first manifested after the patient had reached the age of 30 years. Evans believed they appeared between the ages of 20 and 30 years. The youngest patient in the present Mayo Clinic series was 14 years old and the oldest was 63 years (Table I).

The pain may be sharp and lancinating or a dull ache. It usually courses downward over the ulnar and median nerves, but occasionally extends upward to the shoulder and into the neck. The pain may be more or less continuous but invariably it is exaggerated by rotation of the patient's head or a forceful downward pull of the shoulder. If patients have been told that they have cervical ribs, they are likely to complain of vague pains and general discomfort about the neck and shoulders which I doubt can be attributed to the existence of short cervical ribs. The patient with cervical ribs that actually produce symptoms usually gives the history of pain which follows any sudden or violent exertion. Housewives usually complain of extending pain after sweeping, washing or dusting. One woman complained of pain and numbness along the distribution of the ulnar nerve after difficult labor. A physician complained of severe pain that extended along the median and ulnar nerves after he had struggled with an insane patient who attempted to commit suicide. Hyperesthesia, paresthesia and anesthesia may be associated with the pains and may persist after strenuous exertion. Atrophy of the muscles supplied by the brachial plexus occurs infrequently when it does occur it is manifested late in the course of the disease and is rarely complete.

Vascular symptoms may be ranged in three categories. The first are those which result from changes in blood flow, the blood flow being altered by varying degrees of constriction of the subclavian artery. Patients will com-

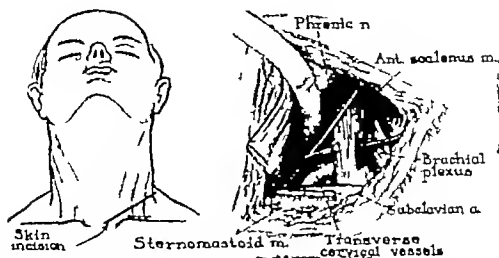


Fig. 6 The operative incision and the anatomic structures in the posterior triangle of the neck.

plain of not being able to work with their hands raised above their shoulders or of not being able to drive a car, to lift a heavy object or to sleep on their sides because one or more fingers become numb when they attempt such things.

The second group of vascular symptoms are caused by actual organic changes (22-35) in the subclavian artery and its terminal branches, characterized by occlusion of the radial, ulnar and brachial arteries and the appearance of edema, cyanosis and gangrene of one or more fingers.

The third group of vascular symptoms are caused by disturbances of the sympathetic nervous system (43) characterized by vasomotor changes not unlike those observed in Raynaud's disease (39). The skin covering the hand is more likely to remain cool, dusky and moist rather than to pass through color changes such as occur in Raynaud's disease. Horner's syndrome on the affected side has been observed many times.

The scalenus anticus syndrome without the presence of a cervical rib has been established as an independent entity. Naffziger and Grant Ochsner, Gage and DeBaKey, Jelsma, Love and others have ably described the syndrome and have supported their opinions by reports of cases. The only additional comment I can make is to emphasize the importance of an accurate diagnosis; if relief is to be expected from scalenotomy.

SURGICAL TREATMENT

A collar incision (1-3) is made for a distance of about 5 centimeters, extending upward and backward from the sternoclavicular articulation over the posterior triangle. The dissection is carried through the platysma myoides muscle and fat until the tendon of the sternocleidomastoid muscle with its attachment to the clavicle is exposed. The clavicular attachment is divided between two forceps. The muscle portion is then reflected mesially so that the tendon of the omohyoid is exposed. This tendon is divided and the tendinous attachment of the scalenus anticus muscle, with the phrenic nerve running obliquely across it from the lateral to the mesial border, is exposed (Fig. 6). During dissection the transverse cervical and the suprascapular arteries are divided and ligated. The scalenus anticus muscle is dissected free and the phrenic nerve is retracted mesially before the tendinous and muscular insertion is divided. The subclavian artery will appear on the lateral side of the scalenus anticus muscle and if the space between the cervical rib (or the cervical rib and the tendinous bands to the thoracic rib) and the lateral border of the scalenus anticus muscle is narrow the surgeon immediately observes compression of the subclavian artery against the trunks of the brachial plexus. On the mesial side of the scalenus anticus muscle the pleura may be observed and if dissection is carried still farther mesially the carotid sheath and the vertebral

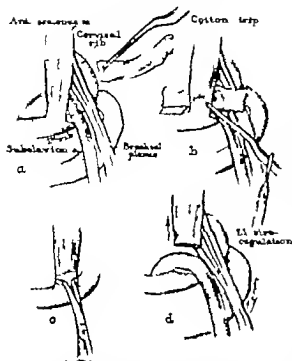


Fig. 7. Steps in the surgical procedure and in protection of the subclavian artery during operation. a, insertion of strip of cotton between the subclavian artery and the scalenus anticus muscle. b, use of electrocoagulation to control bleeding while the tendinous muscular attachment of the scalenus anticus muscle is being sectioned. c, sectioning of the musculotendinous insertion of the scalenus anticus muscle with scissors. d, when the scalenus anticus muscle has been sectioned, the subclavian artery slides forward and assumes normal caliber and the lower trunk of the brachial plexus likewise slides forward and downward.

artery will be exposed this, however, is unnecessary.

It is important to carry the dissection upward on the anterior surface of the scalenus anticus muscle for a distance of 5 centimeters in order to expose the phrenic nerve thoroughly before it is retracted medially. The surgeon must bear in mind before he divides the scalenus anticus muscle at its insertion that it lies over the compressed portion of the subclavian artery and that the pleura is situated medially to the inner border of the muscle in order to avoid injury to both structures. Sectioning of the musculotendinous insertion is most easily accomplished by sectioning the fibers in small groups with scissors (Fig. 7). The cut fibers promptly retract upward, thus exposing the undivided fibers and the compression of the artery. As soon as the scalenus

anticus muscle has been divided, the subclavian artery will be seen to slide downward and take on its normal caliber and the lower trunk of the brachial plexus likewise will slide forward and downward. In the event that there are adhesions between the artery and the brachial plexus, gentle dissection will be necessary to liberate both. Care is required to avoid injury to the vasa vasorum for if they are injured extravasation of blood will take place between the muscular and adventitious coats of the subclavian artery.

Before the surgeon proceeds with sectioning of the bundles of muscle fibers of the scalenus muscle, it is advisable to separate the muscle from the subclavian artery and protect it during the operation by slipping a strip of cotton between the two. This will permit the surgeon to use the electrocoagulating current to control the bleeding while he is sectioning the tendinous muscular attachment of the scalenus anticus muscle. If the muscle is hypertrophied and bulky, it is advisable to resect 3 to 5 centimeters off the lower free end. The incision should be made diagonally across the muscle to avoid a postoperative lump in the neck.

Craig and his assistant in 1937 emphasized the necessity of resection of a portion of the cervical rib. In addition to performance of scalenotomy (15-17) Partial removal of the cervical rib is indicated when the rib is completely formed and occupies a high position as it turns downward (Fig. 8a and b) compelling the lower trunk of the brachial plexus to ride up over it before it continues its course. I remove this portion with a rongeur exposing the amount I wish to remove by retracting gently the lower trunk of the plexus downward and the middle trunk upward (Fig. 9). If it is necessary to operate on both sides, I do not hesitate to do so during the same operation, and I have not found any contraindications to such a procedure.

Before closing the wound I reflect a flap of fat between the brachial plexus and the subclavian artery to minimize adhesions and scarring. The wound is closed in much the same manner as any operative wound is closed. The scalenus muscle retracts upward. If division of the omohyoid tendon has been necessary it

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Fig. 8. a, Bilateral cervical ribs, completely formed with articulated extensions. b, results of resection of these ribs in addition to bilateral performance of scalenotomy.

usually is reunited by suture before the clavicular portion of the sternocleidomastoid muscle is resutured with mattress sutures of chromic catgut. The patient may be permitted to sit up on the day after operation. He may be dismissed from the hospital after 3 days and from the surgeon's care as soon as the wound in the skin has healed.

When the technique of the anterior approach and division of the scalenus anticus muscle is compared with the former lateral approach and resection of a cervical rib, the advantages of the anterior approach are readily appreciated, to say nothing of the relative effectiveness of the procedure. The anterior approach can be carried out with ease and without danger of traumatizing the brachial plexus, whereas the latter requires considerable dissection and retraction of the brachial plexus.

REVIEW OF SCALENOTOMY 1925 TO 1946

The review includes the patients for whom scalenotomy has been performed at the Mayo Clinic during a period of 22 years from January 1925 to December 1946 by members of the neurosurgical staff. There are 142 patients in the series. They have been divided into three groups A, B and C for comparison of the incidence according to sex and age, marital status, sides involved, occupations, groups of symptoms and results (Tables I, II, III, IV and V). In group B, some members of which underwent combined operations of scalenot-

omy and resection of cervical ribs, 9 patients were operated on during 1925 and 1926 when I was convincing myself that scalenotomy could be substituted for resection of cervical ribs in most of the cases. Thus there remain 17 patients for whom since 1927 it was believed that the combined operation was indicated.

Group A includes patients for whom scalenotomy was performed without resection of cervical ribs (63 patients). Group B includes patients for whom combined operations were performed, that is, scalenotomy and resection of cervical ribs by the anterior approach (26 patients). Group C includes patients for

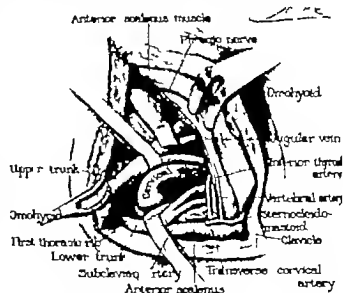


Fig. 9. The anterior approach to the cervical rib when resection is advisable.

TABLE II.—AGE, MARITAL STATUS AND SIDE INVOLVED 142 PATIENTS (49 MALES AND 93 FEMALES) WITH SYMPTOMS OF CERVICAL RIB OR THE SCALENUS ANTICUS SYNDROME

Data	Group						Totals
	A		B		C		
	Male	Female	Male	Female	Male	Female	
Patients	8	5			26	27	53
Single	4	5					9
Married		20		10	5		35
Widow or widower							
Right side		5		8	4		20
Left side	8	10		7			25
Both sides	4				9	10	23

TABLE III.—OCCUPATIONS 142 PATIENTS WHO HAD SYMPTOMS OF CERVICAL RIB AND THE SCALENUS ANTICUS SYNDROME

Group	White collar worker	Laborer	Business	Totals
A	5		20	25
B		5	10	15
C			10	10
Totals	5	5	30	40

whom scalenotomy was performed in the absence of cervical ribs (53 patients)

It is rather difficult to give a comprehensive picture of the symptoms of the scalenus anticus syndrome whether it be associated with the presence or the absence of cervical ribs, since in one case the paresthesias and vascular phenomena may be more prominent whereas in another case the pain which is exaggerated by certain movements may be the only symptom present.

Pain in one form or another is the most common symptom followed in order of frequency of occurrence by paresthesias, vascular disturbances and motor or sensory loss. Unilateral vasomotor changes occurred in more than a third of the patients. In 7 patients the vasomotor changes had to be distinguished from those which characterize Raynaud's disease. Two patients had undergone amputation of the index finger. Four presented gangrene in the first fingers of one

TABLE IV.—OCCURRENCE OF SYMPTOMS OF CERVICAL RIBS AND THE SCALENUS ANTICUS SYNDROME AMONG 142 PATIENTS WHO UNDERWENT SCALENOTOMY

Symptoms	Occurrence in group, times			Total
	A	B†	C‡	
Pain	63	26	44	133
Paresthesias	33		20	53
Motor or sensory loss	5			5
Vascular disturbance				10

†63 patients in this group
 ‡26 patients in this group
 § 5 patients in this group

TABLE V.—PERCENTILE REPORT OF RESULTS OF SURGICAL TREATMENT OF 142 PATIENTS WITH SYMPTOMS OF CERVICAL RIB OR SCALENUS ANTICUS SYNDROME

Result	Per cent of group		
	A	B†	C‡
Relief of symptoms	5	53.8	27.5
Great improvement	26	26	43.5
Slight improvement	10	5	6.5
No change		3.8	5
Death, case		3.8	

†63 patients in this group
 ‡26 patients in this group
 § 5 patients in this group

hand. The radial pulse was absent in 11 patients.

In group C in which cervical ribs were absent the transverse process of the seventh cervical vertebra was unusually large in 16 cases. In the same group the scalenus anticus muscle appeared to be more hypertrophied and more often contained fibrotic bands than was true in those cases in which cervical ribs were present.

division of the subclavian artery could be effected the other recovered without complications. Many patients had a fusiform enlargement of the subclavian artery in its third portion lateral to the scalenus anticus muscle but only one patient had an aneurysm (28 30 38). Four patients had anomalous high arched first thoracic ribs.

The surgical results were both satisfactory and disappointing (Table V). In groups A and B approximately 54 per cent of the patients were relieved of all their symptoms. Approximately a third were greatly improved. They were able to return to their vocations and to carry on but were annoyed by twinges of pain during certain movements. These recurrent symptoms were in all probability caused by adhesions in the surgical wound (21). Results of secondary surgical exploration verified this opinion. One patient did not obtain relief by scalenotomy but secured complete relief after a secondary operation in which the omohyoid muscle was divided and flaps of living fat were used to cover the trunks of the brachial plexus. In 4 other patients the omohyoid muscle was divided at the time scalenotomy was performed. For 5 patients unilateral cervicothoracic sympathectomy was performed in conjunction with scalenotomy. For 4 patients thyroidectomy was performed at the same time that the scalenotomy was done.

In review of the table concerned with results (Table V) it is apparent that the results in group C which includes those patients for whom scalenotomy was performed in the absence of a cervical rib were not so satisfactory as the results obtained in groups A and B. Slightly more than a third of the patients in group C were relieved of their symptoms many were improved by surgical treatment whereas for others the treatment accomplished little or nothing. The reason for this, I believe is too liberal selection of patients for surgical treatment and disregard for the vascular test. Too often the neurosurgeon has been prevailed on to do something when other measures have failed. Perhaps the physician interested in psychosomatic therapy should be called more often in consultation in this particular group of patients. The surgical results

bear a direct relationship to the pathologic anatomy.

CONCLUSIONS

Scalenotomy and sectioning of the insertion of the scalenus anticus muscle, occasionally with resection of the distal portion of the muscle when the muscle is markedly hypertrophied appear to constitute the operation of choice for the condition under consideration.

A combined operation meaning scalenotomy and resection of cervical ribs is indicated when the cervical rib is completely formed and is situated high in the neck so that the brachial plexus must ride over the rib in its course into the axilla. Subtotal resection of the cervical rib can be accomplished with the use of a rongeur through the same wound by separation of the middle and lower trunks of the brachial plexus.

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RESECTION OF THE KNEE JOINT FOR SUPPURATIVE ARTHRITIS

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SUPPURATIVE arthritis of the knee joint is a serious disease. Rarely is the joint restored to normal. If the condition persists any length of time destruction of cartilage and bone is such that a painful knee results. In many cases amputation is required to combat the sepsis which not infrequently results in death. It is not a common condition in civil practice but is a hazard present in all penetrating injuries of the knee.

During the early period in which the 9th Evacuation Hospital acted as a general hospital for the French we encountered 6 patients with wounds of the knee which were either suppurating at the time of arrival or developed suppuration soon after. Characteristic destructive changes occurred in the cartilage of the joint. In 2 of the earliest cases the knees were drained widely by 4 incisions. These incisions were made early in the course of the infection but the destructive changes occurred despite their use. This result corresponded with our civilian experience that is that in a case of suppuration of the knee no matter what the treatment the result is a permanently damaged joint.

At about this time we heard of the practice of resection of knee joints in the presence of infection a procedure the French surgeons had been using for years and one they attributed to Ollier. Naturally our first reaction to the idea of resection carried out during the course of sepsis was one of violent opposition. It seemed like a very radical procedure to cut through infected soft tissues bone and cartilage to disturb the area of resistance seemed to violate a surgical principle. On the other hand the French advocates of this procedure pointed out its advantages. Major Curtillet the consulting surgeon to the French forces influenced us to try it. As he presented it the

procedure was not new but had been tried prior to the first World War by the French.

In brief the resection consists of removing the femoral condyles at the highest level attained by cartilage and the upper half inch of the tibia. The synovia is then excised. The object of the operation is to shorten the course of sepsis by removing feebly resistant cartilage and the areas of infected bone and synovia. Once these become involved they remain so for a long time. Life and limb are saved by diminishing this period of sepsis, during which the patient becomes very toxic and depleted. The procedure accepts the fact that suppurative arthritis in the knee results in a permanently damaged joint which is either ankylosed or possesses some degree of painful motion. Consequently the fusion is performed at the earliest possible moment thus saving the patient time and suffering. The operation removes the suppurating tissues of low vitality which harbor infection and at the same time secures really adequate drainage. Success is not always achieved. Major Curtillet was frank to say that occasionally nothing is gained and that amputation is not avoided. He did not fear untoward effects from resecting suppurating joints. The optimum time to resect is early in the first 2 weeks.

Resection of a joint in the presence of infection is often referred to by the French as secondary resection. The term primary resection is used for resection done at the time of debridement and is done because the operator feels that destruction of articular surfaces precludes the return of good function to the joint and that joint infection will develop. French surgeons do primary resections of practically all joints even phalanges though we have seen it used mostly for knees and elbows. We have since resected a few joints ourselves when the indications were very definite.



Fig. 1. Case 2. a. March 4—1 month after bounding having external tibial fracture and destruction of articular surface of femoral condyle. Detail is obscured by plaster. b.

Three months after resection. A little callus is present anteriorly. Only the slightest amount of motion could be produced by manipulation.

namely when fractures were so extensive that there was no hope of regaining any joint function.

OPERATIVE TECHNIQUE FOR RESECTION OF THE KNEE JOINT

A variety of incisions are used. The transverse incision employed by Major Curtillet seems best. This is an elliptical transverse incision removing the patella. The anterior and posterior cruciate ligaments are divided and the knee joint is flexed—an assistant supporting it with a rolled bath towel in the bend.

The femoral condyle is sawed off at a level just proximal to the intercondylar fossa, and the remaining cartilage stripped free from the underlying bone. The tibial condyles are then sawed off as conservatively as possible but removing all joint surface. Cuts are made so that 5 to 10 degrees of knee joint flexion result. The synovia is completely excised. If a tourniquet has been used it is now removed. Drains are placed at the angles of the incision. One heavy wire suture may be placed through the anterior margins of the bones to prevent forward or backward slipping. A few



Fig. 2. Case 3. a and b. Roentgenograms taken February 7, 1944. Circular defect made in posterior part of medial condyle at first operation can be seen on lateral view.

There is no detectable erosion of weight bearing surfaces. c and d. Show marked erosion of condyles seen on March 12, 1944 the day before operation.

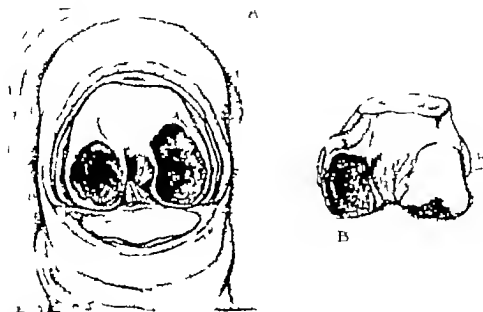


Fig 3 Drawing illustrating extensive erosion of both condyles of femur as seen at operation

sutures may be inserted to approximate skin loosely and to prevent retraction. Dressings and a spica are applied. Drains are removed in 5 to 10 days and the spica is changed as needed. It does not take long for muscle shortening to close the gap. In cases in which the wound is on the posterior aspect of the knee the wound may be enlarged and used for dependent drainage. Otherwise one turns the patient, in the spica face down at intervals. As frequently there remain fractures of the bone adjacent to the resected joint abscesses which require drainage may develop.

It is not our purpose in this paper to discuss the clinical features and course of this disease, but one pathological feature is worthy of note. The earliest destruction of cartilage occurs at the points of contact between the two bones. The greatest damage is found at these points as the lesions advance. The medial femoral condyle is usually first involved. This observation has been previously described by Phemister and others.

Another point which experience and previous observations have tended to confirm is the inadequacy of any prescribed means of draining the knee. We have used 2 large parapatellar incisions together with a third one behind the medial ligament and a fourth just posterior to the lateral ligament. Two of the cases about to be described had drainage of

this sort. These incisions may relieve the tension of the pus, but pools remain in the deep recesses of the joint, and a film is retained between surfaces in close contact. Here between the condyles and between the menisci and condyles the film of pus is held by capillary attraction.

CASE REPORTS

Following are 6 case reports which form the basis for this paper.

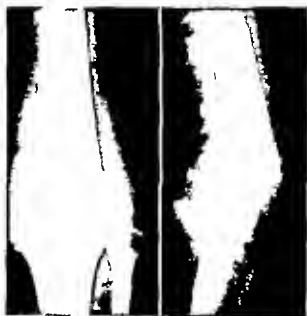


Fig 4 Case 3. Roentgenograms taken 6 weeks after operation. Note the evidence of callus formation.



Fig. 1. Case 4. March 6, 1944, month after wound. Marked destruction of medial femoral condyle by infection. Early changes are seen in the lateral condyle.

b. June 6, 1944, 3 months, minus 1 week, after resection. Fracture line still visible but with callus seen in margins. Knee solid on recall.

CASE 1. This patient, a Tunisian Arab, was wounded by a bullet on January 27, 1944, at 8:00 a. m. The missile entered the left knee medially and made its exit through the posterior aspect of the upper third of the calf. After 24 hours' first aid treatment was given including local sulfanilamid powder. About 64 hours after injury the patient was operated upon in a mobile French hospital. At operation it was found that the knee joint had been opened and that there was a complete fracture of the medial tibial condyle. The knee joint was not closed; the wound was debrided and the leg placed in a cast.

Ten days after injury the patient arrived. He appeared acutely ill, pale but his temperature was normal. He complained bitterly of pain in his knee and because of this on the following day the cast was removed and the wound was redressed. Because of diffuse swelling in the knee region and extreme pain on motion purpurative arthritis was suspected. The wound was dressed and a cast was reapplied. The patient's temperature rose thereafter and ranged between 101.8 and 104.8 degrees. On his 4th day in our hospital the knee joint was aspirated and cultured (*Bacillus hemolyticus* streptococcus) incision were made at the knee joint at four places and three P. nose drains were placed in the joint. Day to repeated transfusion and parenteral sulfonamide therapy the patient continued to run a septic temperature curve. This septic course continued; the patient lost his appetite, suffered occasional chills and looked extremely ill. Finally 23 days after admission and 20 days after drainage of the knee joint amputation was decided upon as the only procedure which would save the patient's life. Resection of the joint was considered but abandoned as the patient had no experience with it. A guillotine amputation through the lower third of the left thigh was done. The amputated knee revealed extensive periarticular edema. Covering the entire edematous synovial lining of the joint was a

hemorrhagic fibrinous exudate. There was destruction of the cartilage on the weight-bearing surfaces of the femur and tibia down to the bone. Progress following amputation was satisfactory.

CASE 2. This young adult Arab was wounded on February 3, 1944, by a bullet which perforated the upper tibia from behind forward. The fracture was badly comminuted and was of the "vertical" type with the fracture lines extending into the joint. Evacuation of the wound of exit and wound toilet were performed at a French evacuation hospital about 24 hours after injury.

On his arrival on February 12, 1944, the patient seemed quite ill and had a fever of 103 degrees. Next day the cast was removed revealing a wound 3 by 2 centimeters about 5 centimeters below the patella and another wound 1 centimeter in diameter in the popliteal space. The anterior wound which was discharging foul blood turned purulent. Sulfanilamid powder was instilled and a plaster applied. X-ray film revealed the fracture described and several small foreign bodies about the fracture site. A blood count on February 18 revealed a hemoglobin of 54 per cent, Sahli red blood cell 2,900,000, white blood cell 34,200 with 75 per cent polymorphonuclears. After the drainage procedure the fever dropped to 100 degrees and remained so for only a few days.

During the succeeding 3 weeks the patient ran a septic course and went progressively downhill. He had unappreciable little pain. In this period he received intravenous plasma, blood, and sulfadiazine therapy. On March 4 x-ray films showed osteomyelitis of the tibial condyle, narrowing of the joint space and evidence of destruction of condylar cartilage—the picture of acute suppurative arthritis. Serum protein was 5.6 milligrams per cent, hemoglobin 60 per cent, red blood cell 3,050,000, white blood cell 20,000, polymorphonuclears 80 per cent.

On March 11—3 weeks after injury—there was foul smelling pus exuding from both aterior and posterior wound. The knee joint was distended

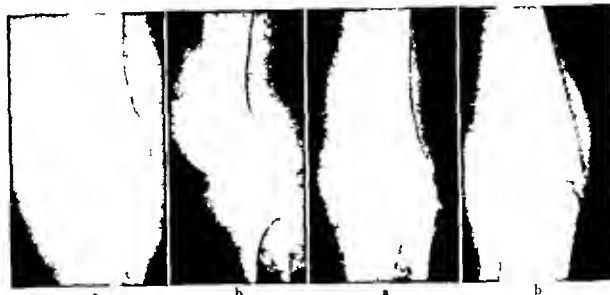


Fig 6

Fig 7



Fig 6c.

Fig 6 Case 5. a and b, Preoperative roentgenograms. Patella is absent. Eroded area could be seen on films. c, Illustrates ulcerated area of medial condyle found at operation.

Fig 7 Case 5. Roentgenograms taken 6 weeks after operation. There is early evidence of callus formation.

Resection of the knee joint was decided upon and done that day. A U incision base upward was used. The joint was filled with thick, gray pus. The femur was sawed across at the highest point reached by the articular cartilage. The tibial articular surface was resected with rongeurs and curette. It was impossible to do otherwise as the large condylar fragments were so free and we were anxious not to disturb the remaining bone and its blood supply. The edematous synovia was excised. Dressings and a spica were applied after placing drains laterally and medially. The leg was held so that an inch gap between the bones was maintained. No suturing of the skin or flap was done, but the patella was removed. Cultures made at the time of operation grew a hemolytic staphylococcus and a hemolytic streptococcus. One thousand cubic centimeters of blood was given postoperatively.

Examination of the excised specimen showed a large area of destruction of the medial femoral condyle. The same type of lesion involved the lateral

condyle but to a lesser extent. On both sides bone was involved but only a few millimeters were necrotic. The cartilage of the contact surfaces of the tibia was also gone but destruction of the underlying cortex was minimal. The menisci though still present, were soft and the sharp inner edges dissolved. The periarthritic tissues were slightly swollen.

Liberation of pus is thought to account for the abrupt fall in temperature which resulted. The patient's immediate postoperative course was very satisfactory with the temperature remaining near normal. Two and a half weeks after resection the patient developed a spiking fever and a large abscess communicating with the fracture and extending down the lateral anterior fascial compartment of the leg was drained. Culture of this abscess showed that *Bacillus pyocyaneus* had been added to the organisms originally present.

Improvement following this drainage was short lived and 10 days later on April 8 a pooling of puru-



Fig 8 Case 6. a, Preoperative roentgenograms taken March 8, 1944. b, Preoperative roentgenogram taken March 4, 1944. Not the extensive loss of substance of upper part of shaft of tibia, with the marked comminution of fragments.

Fig 9 Case 6. Roentgenograms taken on May 4, 1944, 43 days after operation. Small sequestra can be seen adjoining defect of tibial shaft. The lateral view gives evidence that the defect is being bridged by new bone.

lent drainage noted between the end of the femur and tibia was drained posteriorly. During this procedure an old hematoma anterior to the tendon of the semimembranosus muscle was found and evacuated. At the same time moderately deep jaundice was noted as well as pleitic enlargement. The jaundice was felt to be due to a nonhemolytic transfusion reaction. During this period (March 29 to April 15) penicillin became available and was given. The temperature remained normal after the second drainage and remained so until the patient was evacuated May 31. At that time he could raise the limb off the bed without pain. When the knee site was tested for motion a minimal amount could be produced and this was painful. All wounds were healed except a small granulating area 1 by 1.5 by 2 centimeters deep between the tibial condyles. The knee site was kept immobilized to promote union. His general condition was excellent. Roentgenograms on May 31 showed the bones in perfect apposition and the leg straight. There was a little callus visible at the anterior edge of the tibia. Between the condyles of the tibia was an area of decreased calcification. No evidence of sequestra was present.

This was the first case in which resection was performed. Resection should have been done much earlier. The complicating abscesses were due to osteomyelitis of the fractured tibia. It was this in fact which had led to suppuration of the knee, as the missile had not passed through the knee joint. The immediate response to resection was excellent. Adequate drainage was obtained. Although the course

of the infection was long it would have been longer—and the toxemia greater—had the knee not been resected. Life and limb were being threatened. Bony union had not been obtained at the time of evacuation (4 months after injury, and about 3 months after resection). It is believed a satisfactory union bony or fibrous, will result. Residual infection in the tibial condyles and our failure to place the bones in apposition soon enough, and general debility are the possible causes for the failure to secure early fusion. The extensive comminuted fracture was a bad set up for any treatment.

CASE 3. This white French soldier received a shell fragment wound in the outer aspect of the right knee on February 2, 1944, at 10:00 a.m. At 8:00 a.m. on February 3, 1944, he was operated upon at a French evacuation hospital. The shell fragment was removed from the posterior part of the lateral femoral condyle through a posterior incision in the popliteal space. This approach traversed the joint. The entrance wound was incised but not divided.

Four days after wounding he was admitted to hospital complaining of pain in the knee and with a fever of 100 degrees. He gave a history of chronic malaria recently treated.

Incision of the wound showed a long, clean, granulating vertical incision. The wound of entrance was now 1½ inches long and situated just above and anterior to the head of the fibula. Pressure on the suprapatellar pouch caused clear synovial fluid

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to exude. During the subsequent few days this fluid became purulent as his temperature rose to 102 degrees.

On February 11 the knee joint was drained under pentothal anesthesia. Two anterior incisions were made as well as posterior ones. These latter drained the posterior portions of the joint behind the condyles. Penrose tubing was inserted. It was interesting to note that relatively clear joint fluid was obtained through the posterior incisions while frank pus was present in the suprapatellar pouch. A smear of this showed staphylococcus.

During the following month the patient's course continued septic. Temperature peaks varied between 101 and 102 degrees. The resulting anemia (red blood cells 2,800,000 and hemoglobin 61 per cent) was combated successfully with six blood transfusions (blood count on March 12: red blood cells 4,600,000 hemoglobin 78 per cent white blood cells 11,500). Sulfadiazine irrigations and immobilization in a spica did not prevent destructive changes in the joint as shown by x ray on February 26. Roentgenogram revealed narrowing and early necrosis of the bone of the medial and lateral condyles. After consultation with Major Curtisset of the French Army a resection was done on March 13.

Under general anesthesia and with a tourniquet in place the lower ends of the two lateral drainage incisions were extended distally and curved to meet thus forming a U. This incision included all layers. The patella was excised. After the cruciate ligaments were severed the knee joint was flexed and the femur dislocated anteriorly into the wound. About 1 3/4 inches of the femoral condyles were removed with a saw all the joint surface being removed. Approximately a half inch of the tibial condyles was then sawed off. Following this all the remaining synovia was excised. The U flap was sutured with two wire sutures, wide open drainage sites being left laterally. No drains were inserted. The raw bony surfaces of the femur and tibia were placed in contact in 5 degree flexion and a spica was applied.

A culture of the pus obtained at operation showed *Staphylococcus aureus* and a diphtheroid bacillus. The joint had contained pockets of white, thick pus, and all the contact surfaces of the femoral and tibial condyles were eroded. The menisci were completely dissolved and the cruciate ligaments had almost disappeared. The synovia was edematous and hemorrhagic.

During the first month after operation his temperature course continued to suggest sepsis. His spica was twice changed and the local area found to be doing well. Finally on April 9 after a temperature rise to 104.2 degrees, accompanied by tenderness over the liver a positive smear for malaria (*Plasmodium vivax*) was obtained. Malaria had long been suspected but previous smears were negative and no therapy was given until this time.

Under atabrine therapy his temperature returned to normal. On April 18 an x ray film showed callus developing (5 weeks after operation). Clinically the

knee fusion was firm under gentle manipulation. Two weeks later the spica was discarded and a cast was applied. The patient was soon up and around walking with crutches. On June 1 he was evacuated to Africa.

A letter from him in August of the same year stated his wounds were well healed and that he was bearing weight though still using crutches.

This case represented a very severe staphylococcus suppurative arthritis of the knee complicated by recrudescence of an old chronic malaria. His marked sepsis produced a profound secondary anemia that required many transfusions. In the light of more recent experience arthrotomy with thorough cleansing of the joint irrigations and local penicillin instillations (which was not then available) might have cleared up the impending suppuration if it had been performed during the first few days after admission. His progressively downhill course makes us believe that it would have been necessary to amputate his leg in order to save life, if the arthrectomy had not been performed. His primary treatment can be criticized for its failure to close the deep layers of the wound of entrance, and in applying a mid thigh cast instead of a spica.

CASE 4. This 32 year old Tunisian Arab was wounded at 11:00 a.m. February 2, 1944, by shell fragments. Forty-eight hours later he was operated upon at a French evacuation hospital and the following is a summary of their note.

Left leg. Compound fracture of the lower tibia. The wound was excised, and 2 other large wounds of the same leg were debrided radically. A comminuted fracture of the medial femoral condyle with an opening into the knee joint was treated by excision of the entrance wound and establishment of through and through drainage of the suprapatellar pouch half inch rubber tubing was used. The leg was immobilized in plaster to the hip. In addition large wounds of the right calf and left hand were present.

The patient was received by us on February 6, 1944. His temperature was 101 degrees, pulse rapid and he was stoically bearing considerable pain. The wounds were inspected the next day and this note was made: Has an open wound of the left knee with projecting heavy rubber tubes. These removed. Some gray yellow slough, where there has been contact between the wound edges and the rubber tube drains. It would be impossible to close the joint. There is no swelling of the knee. [Other wounds then described.] All wounds clean. Sulfanilamide vaseline gauze and a cast applied to left knee. Culture of the tracts into the knee joint later grew *Staphylococcus albus* and a diphtheroid bacillus.

The patient was given supportive treatment consisting of plasma, transfusions sulfadiazine, vitamins and iron.

During the next 12 days the patient's pain diminished somewhat but fever with daily rises to 102 or 103 degrees persisted. On February 13 his hemoglobin was 54 per cent, red blood cells, 2,500,000 white blood cells, 10,350 with 76 per cent polymorphonuclears. February 19 the patient was re-dressed. There was little tenderness, and no destruction of the joint, but pressure on it caused a slight synovial leak. It was felt that the fever was due to his other wounds especially the compound fracture which presented a small pool of brownish pus.

On March 10 the cast was again removed and at this time any movement of the knee was painful. There was some periarthritic swelling but no increase in joint fluid. An x-ray film showed evidence of marked bone destruction involving practically all the articular surfaces of the knee (Fig. 5). Destruction is particularly marked in the region of the medial femoral condyle. Fever to 102 degrees daily persisted.

On March 13 the knee joint was resected. During preparation of the leg, flexion caused the now closed medial drainage wound to pop open and discharge some granulation tissue. No other fluid was present in the joint. Destruction of cartilage and bone was noted on the contact surface of the medial femoral condyle. The medial tibial condyle showed less marked destruction. Some of the medial meniscus had been digested. The synovia was gelatinous. The lateral condyles of femur and tibia were eroded of cartilage where there had been contact. Cultures made from the joint fluid grew a weakly hemolytic *Staphylococcus aureus*. The operation was performed by Major Curtlett, French consultant surgeon who resected an inch of femoral condyle and the articular surface of the tibia. A single wire suture was placed in the bone ends to prevent the surfaces losing contact and sliding back and forth. Rubber tube drains were placed at the lateral and medial ends of the transverse incision through which the patella had been removed. The wound edges made contact without suture. The knee was flexed 15 degrees. A spica was applied.

Before operation the patient had received 6 transfusions of 500 to 600 cubic centimeters each. The last two were accompanied by rather severe reactions. The preoperative blood count was hemoglobin, 64 per cent, red blood cells, 3,700,000 white blood cells 5,900, with 63 per cent polymorphonuclears.

The temperature course during the next 17 days was not changed by the resection. During this period the spica was twice changed. The drains were removed on March 25—10 days postoperative. Cultures at this time showed that the *Bacillus pyocyaneus* as well as the *staphylococcus* was now present in the wound.

When we obtained some penicillin the patient was given 1,270,000 units during a 6 day period (March

28 to April 5). In the subsequent 2 to 3 weeks his temperature gradually fell to normal. His last count on April 15 was hemoglobin 71 per cent, red blood cells 3,580,000, white blood cells 7,400, with 52 per cent polymorphonuclears.

The patient's wounds were skin grafted on May 4, and he was finally evacuated to Africa June 18—1 months after being wounded. The knee was solid and weight had been borne in spite of a nonunion of the fracture of the lower third of the tibia. The 'fracture' line between the condyles was easily visible by x ray and there was little callus. No one would not have hesitated to allow weight bearing had it not been for the leg fracture.

A letter written by him on August 3, 1944 from Africa stated that union of his leg fracture had not yet occurred.

As far as the knee is concerned, this patient's convalescence was shortened by resection. With the amount of joint destruction which occurred any motion would have been painful and there would have been deformity as well.

In retrospect we believe thorough débridement—even 48 hours after wounding—with closure of the joint, might have prevented infection. Under the newer program to be described later we too could have closed the joint and prevented suppuration. In our opinion a joint left open for whatever reason should never be dressed until it becomes sealed by granulations, otherwise infection will develop. Contamination occurs during dressings no matter how carefully they are done.

CASE 5 This Arab received a perforating shell fragment wound of the right knee on March 3, 1944. The patella was comminuted. The shattered patella was removed and the popliteal space debrided at a French evacuation hospital.

He arrived at our hospital on March 7, 1944, in good condition in a hip spica. An x-ray examination revealed the absence of the patella and slight erosion of the anterior surface of the external femoral condyle. On March 11 because of pain and a slight fever his knee was inspected. At the lower end of a U-shaped Gillier incision a small portion of the femoral condyle could be seen. The wound edges appeared healthy and with a little undercutting the joint was closed without tension fine wire sutures being used. The vertical popliteal wound was partially closed.

The joint infection became more apparent. Patient's temperature rose to 102 degrees. He developed an anemia and his blood count was, red blood cells, 3,020,000 hemoglobin 61 per cent white blood cells, 10,400, with 77 per cent polymorphonuclears. Culture of the pus from both anterior and posterior incisions revealed *Staphylococcus hem-*

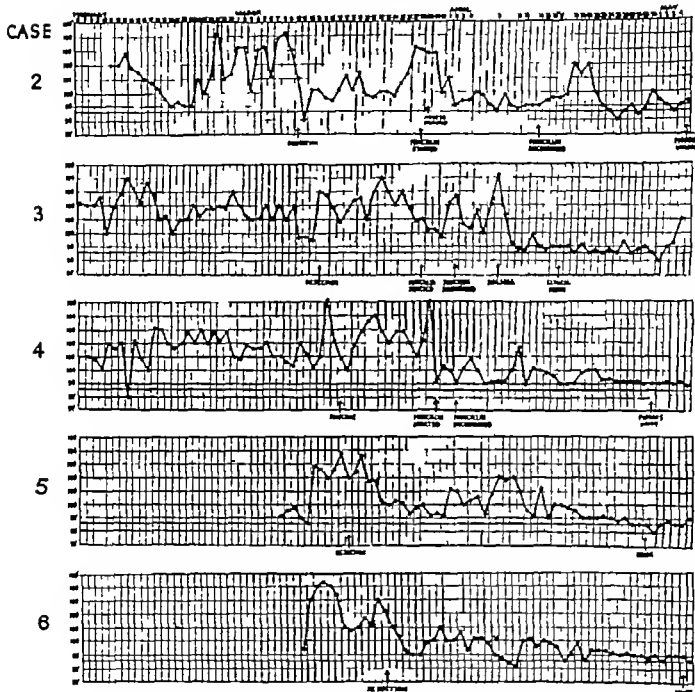


Fig 10. Chart showing highest daily temperatures in Cases 2 to 6

lyticus and *Bacillus pyocyaneus*. A roentgenogram showed joint narrowing and further erosion of the external femoral condyle.

On March 17 an arthrectomy was done, with removal of 1 inch of the femoral condyles and $\frac{3}{4}$ inch of the tibial condyles. The synovia was completely excised. A small area of the medial femoral condyle had been eroded down into the cancellous bone. The joint contained considerable pus. Following removal of the condyles, two wire sutures were placed through the anterior edges of the cortex of both bones to hold them in proper approximation. Drains

were placed at the lateral angles. A hip spica was applied.

The patient's postoperative progress was very satisfactory and by May 4 (7 weeks) callus between the fragments was seen by x ray. His temperature had not risen above 99 degrees. One complication a foot drop, developed postoperatively and was still present at the time of his evacuation to North Africa on June 1.

Arthrectomy was performed very early after the first evidence that suppuration and

If less bone is removed it is obvious no skin should be excised.

Resection of joints during suppuration has, we believe a place in American surgery. It is to be hoped that better surgery and penicillin will make its place a small one. Prevention according to a plan first advocated by Colonels Hampton and Lyons, made such strides that the number of suppurating joints markedly decreased. We subsequently performed arthrotomies on 202 penetrating wounds of the knee joint and although our follow up is limited we are reasonably sure that few have developed suppuration. The necessity of sometimes evacuating large numbers of patients did not permit us to be certain of a few of them who were evacuated within several weeks of injury. Many of the group were undoubtedly saved from developing knee joint infection by application of the plan here outlined.

The plan emphasized arthrotomies through adequate incisions of the joint whenever the presence of infection or devitalized tissue in the joint is suspected. A thorough débridement is then done with removal of foreign bodies, blood clot, and devitalized bone and cartilage. The joint is irrigated and the synovia is closed. Before closure 10,000 units of penicillin is placed in the joint. Irrigation with saline through a large needle and injection of penicillin are repeated if indicated. A spica must be used for adequate immobilization. Blood volume is restored by multiple transfusions.

The penicillin program as outlined will undoubtedly reduce to a minimum knee joint suppuration and we believe it should be car-

ried out before resection. We also believe that drainage may be attempted before decision is made to resect. If despite drainage the suppuration persists and destructive changes become visible by x ray resection should be recommended. This program may bring resection into the picture later than the optimum time for it and later than the French recommend. However the present results obtained by the combination of good surgery, closure of the synovia, penicillin and blood restoration seem to justify the delay.

SUMMARY AND CONCLUSIONS

- 1 Six cases of knee joint suppuration following shell fragment wounds are reported.
- 2 In 1 case amputation was done and the joints were resected in the remaining 5.
- 3 The resections were done during an active stage of suppuration.
- 4 No patient had any immediate reaction to the resection which was unfavorable. In 2 who needed drainage (Cases 2-6) the reactions were immediately favorable.
- 5 It is believed that the course of the infection has been shortened and that the resulting fusion of the knee is an acceptable end result.
- 6 It is believed this procedure properly carried out will frequently save life and limb by shortening a suppurative infection which not infrequently threatens both.
- 7 It is believed that a program of wide arthrotomy and thorough débridement with closure of the joint when possible together with penicillin therapy, transfusions as indicated and adequate immobilization will prevent knee joint suppuration in war wounds.

BREAST CANCER

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BREAST cancer is the most common type of neoplasm having almost twice the incidence of that of the next site the cervix (Fig. 1). Thirty seven of every 1,000 women who reach maturity will become victims of this disease and more than 15,000 women die annually from it in the United States (Fig. 2). Moreover carcinoma of the breast is increasing at the rate of nearly 1 per cent per annum and is not a preventable disease. Cancer of the lip, the tongue, the skin and the cervix are lesions which in a measure may be prevented but so little is known of the etiology of breast cancer that little hope can be entertained at present as to its prophylaxis.

Yet, the present outlook in breast carcinoma is by no means discouraging. The facts and figures are all to the contrary and show that the prognosis is increasingly hopeful and constantly improving (Table I and Fig. 3). Of the 15,000 women who die annually, 10,000 can be saved by surgery alone if the lesion is discovered while confined to the breast (Fig. 4). (This means a salvage of 29 of the 37.) After the disease has spread to the axilla only 6,000 can be saved by surgery, x-ray and radium combined (Fig. 5). Our greatest hope for continued progress in the problem of breast cancer lies in a program of education of both patient and practitioner toward early diagnosis and in the education of surgeons toward a more thorough, extensive and meticulous radical operation.

to examine their breasts monthly during the mid period. This will place a good part of the responsibility where it will best be met—on the patient herself. She will educate others. This instruction is not so likely to produce unfounded fears as it is to lead to the satisfaction which comes from early discovery of any lesion which may arise.

A slow but steady improvement is being made in the radical breast operation. Surgeons, realizing that standardization is often a barrier to progress, are getting away from the old limited orthodox types of procedure such as the Halsted and Willy Meyer. With a broader concept based on the more recent elucidation of the pathology, the modes of spread, the routes and pathways of spread and with an intimate knowledge of the anatomy the radical dissection is being extended and we are operating not only with our eye but with our mind's eye.

Sampson Handley has made two definite additions to the radical breast operation: a wider area of fascial removal and removal of the epigastric nodes. For many years we have constantly emphasized: (a) the necessity of a systematized procedure to gain thoroughness; (b) the necessity of completely mobilizing skin flaps for better exposure and haemostasis; (c) the removal of all superficial fascia from the skin flaps; (d) a method to avoid handling or squeezing the breast during the operation; (e) a method to insure the removal of all five groups of nodes (including subscapular and

NUMBER OF INCIDENTS	SITE	SEX	ANNUAL INCIDENCE
1	BREAST	FEMALE	34.3
2	CERVIX UTERI	FEMALE	29.7
3	BLAD	MALE	2.1
4	STOMACH	MALE	1.9
5	COLON	FEMALE	1.9
6	PROSTATE	MALE	1.2
7	BLAD	FEMALE	1.2
8	OVARY	MALE	1.2
9	STOMACH	FEMALE	1.2
10	RECTUM, RECTOSIGMOID	MALE	1.2
11	UTERUS	MALE	1.2
12	OV. CY	FEMALE	1.2
13	RECTUM, RECTOSIGMOID	FEMALE	1.2
14	TESTIS, EPID. BM	FEMALE	1.2
15	BLADDER	MALE	1.2
16	LEUCOCHIA	MALE	1.2
17	PANCREAS	MALE	1.2
18	LIVER	FEMALE	1.2
19	BLADDER	FEMALE	1.2
ALL SITES FEMALE 179			ALL SITES MALE 28

Fig. 1 (Chart showing average annual incidence rates of breast cancer per 100,000 population, New York State, exclusive of New York City 1942, 1943, 1944.)

A more thorough technique a greater dissemination of proper technique and its more regular use by larger and larger groups are some of the basic reasons for gradual improvement in results. There has also been gradual improvement in x ray equipment higher voltage machines, improved methods (Coutard etc) and technique all of which has meant added success.

Early diagnosis continues to be of paramount importance this one factor counting for the salvage of 4,000 additional women each year. While it is not possible nor appropriate to go into the details here of the diagnosis and differential diagnosis of breast cancer certain vital facts should be repeatedly emphasized.

(1) Seventy per cent of all breast lesions admitted to the hospital are malignant. (2) Peau d'orange elevation or retraction of the nipple axillary node involvement are the signs of advanced carcinoma of the breast and it is negligent to await their development. (3) A knowledge of three simple lesions fibrocystic disease, fibroadenoma and cysts will together with carcinoma, comprise the diagnosis in 87 per cent of cases. (4) The patient with fibrocystic disease is five times more likely to develop cancer than the corresponding age group with normal breasts (Fig. 6). This is the only type of breast lesion in which 'observation' and repeated examination is indicated and safe. (5) Most important of all it should be

repeatedly emphasized that there is *not any kind* of discrete mass in the breast that does not require removal and microscopic examination. The policy should always be 'look and see, not 'wait and see.' If there is a discrete mass observation is neglect. Carcinoma often masquerades as mastitis and mastitis masquerades as carcinoma. This is particularly true in the diffuse papillary type of fibrocystic disease and in the menopausal woman with ectasia and periductal mastitis. (6) It should also be emphasized that the commonest of all breast lesions (fibrocystic disease) is the most difficult to differentiate when localized and the very one in which cancer is most likely to occur. These facts make frozen section imperative in this type. (7) Bloody discharge from the nipple means carcinoma until proved otherwise. About 50 per cent of papillary cyst adenomas and intraductal papillomas become malignant. (8) Skin dimpling, fixation, or tethering is one of the latest of the early signs and one of the earliest of the late signs. Do not depend on it nor wait for it. (9) Axillary nodes are not palpable in 30 per cent of cases when involved. Another 30 per cent will show only hyperplasia in breast malignancy. (10) In about 95 out of 100 times the diagnosis can be made in the 'gross' when the lesion is removed. In the five doubtful or borderline cases frozen section is a reliable procedure. Aspiration biopsy is of definite but limited value. A negative means nothing. It is of limited application because many lesions by their very nature require a tissue pattern for

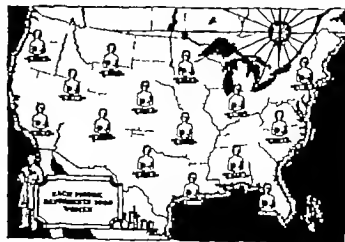


Fig. 2. Fifteen thousand women die annually in the United States of breast cancer.

ing with these facts are the statistics of China. For centuries dating back to the Ming Dynasty (1368-1462 A.D.) Chinese women of the upper or Mandarin class have abhorred large breasts (and large feet). It has long been their custom to bind their breasts as soon as the baby is born and turn the infant over to an Amah (wet nurse). The statistics of China show that the incidence of carcinoma of the breast among the Mandarin women is the highest in the world and among the Amahs the lowest recorded. Castration produces no such involutonal effect on the breast. In fact the anterior pituitary and adrenal cortex make up a compensatory mechanism for the manufacture and excretion of steroids to the end that after castration the estrogen titer is often up to or in excess of normal. No such biologic compensatory mechanism exists in the male and the results of castration for breast cancer in the male are more profound and lasting and compare with or even surpass those seen in prostatic carcinoma. Castration seems to be more effectual in the prevention of breast cancer in susceptible strains of mice and when done before the animal reaches maturity cancer rarely develops. This is similar to the observation I have mentioned many times—that it is extremely rare to see carcinoma of the breast in bitches which were spayed young i.e. before their first heat.

It is interesting to note also that the thyrotropic hormone of the pituitary has been used to offset the stimulating effect of estrogenic hormones in cancer susceptible strains of mice. In this connection it should also be recalled that a duct growth hormone, a separate and distinct entity has been isolated by Taylor and Turner (Bureau of Animal Husbandry Veterinary Experimental Station Maryland). Not only does this duct growth hormone increase the development of milk ducts but its effects are so marked in developing the udder in both open and bred heifers that its commercial possibilities in the dairy industry are being investigated.

In the past few years a great deal of interest has been aroused by reports of the milk factor in breast cancer by Bittner and his associates. Research workers in Holland and in Bar Harbor Maine concluded about the same



Fig. 6 Comparison of the incidence of carcinoma in normal breasts and in breast affected by fibrocystic disease. The ratio is 5 to 1

time and independently that transmission of breast carcinoma to the offspring in susceptible mice strains was through the mother and extrachromosomal. With this basic fact in mind, Bittner and his co-workers have shown that in strains of mice susceptible to breast cancer if the litter is allowed to nurse their mother although she has not cancer of the breast the females of the litter develop the disease. If the females of the litter are given over to a foster mother of noncancerous strain they do not develop the disease. It was found also that if these susceptible female offspring nursed their mother only once the lesion developed and only by placing them with a foster mother before they nursed their own mother at all could the disease be prevented and this prevention was absolute. A more striking fact is that by carrying out the experiment in the opposite direction cancer of the breast was implanted in strains of mice having no such susceptibility. A single nursing not only establishes the factor in the young female but in all her descendants and whole races of mice can be saved from developing mammary carcinoma by preventing them from nursing their mother at all.

The milk factor does not produce its effect immediately. It reaches the breast through the intestine apparently increases in quantity as the breasts develop and when the mouse grows old cancer develops in her breast. In the meantime she has transmitted the factor to the females of each successive litter. In some highly susceptible breeds, this happens in every individual. The milk factor is present in large amounts in the breasts of these individuals and although it will not produce the disease directly when injected into other aged individuals one millionth of a gram of mammary tissue yields enough of it when extracted with saline to confer the disease on an endless series of animals. A great deal of experimental



Fig. 3. The American College of Surgeons, 1945 report. Of a total of 1,636 cases there were 57.3 per cent cures. Ten per cent are less than 30 years of age. Best results were obtained in the 35-50 year age group poorest results in 50-60 year age group. Heredity as a factor in 30 per cent. Nulliparas numbered more than 1 out of 10.

TABLE I.—RADICAL OPERATIONS—5 YEAR CURES

Period	Cumulative percentage per case
800-900	8
900-91	5
910-930	30
930-950	41
950-960	50
945—American College Surgeons	57.3

differentiation. Inasmuch as *each and every* discrete nodule in the breast requires removal aspiration biopsy is an unnecessary procedure. It may when negative confuse the picture and lead to refusal of operation. There is nothing which will replace the satisfaction of getting the gross specimen in one's hand and examining it. I am sure we shall all save more lives that way.

Regarding the etiology of mammary carcinoma, little can be said and less proved. Recently many facts have developed which have led to interesting speculation. The hereditary factor is difficult to evaluate. The impressive experiments of Maud Slye in the inbreeding and outbreeding of cancer mice have been repeated and confirmed by many observers. In the human organ specificity seems to be the most important consideration in heredity and is present in 20 per cent.

The effect of estrogens continues to be stressed and cancer of the breast has been produced in both susceptible and nonsusceptible strains of mice by administering estrogens in

large quantities for prolonged periods. Many clinicians have reported cases of breast carcinoma following prolonged treatment of menopausal women with estrogens in high dosage. While these reports are not conclusive, and while it is a fact that the doses given are far in excess of the physiological titer they are impressive and suggest that great caution should be used and estrogens should not be given to any woman in amounts greater than normally occurring and none at all to women with a family history of carcinoma especially of the breast and none to women who have been operated upon for cancer of the breast nor to any woman with a breast tumor of any kind before or after operation or other treatment.

To the clinician breast stasis and arrest of function continues to be the most important and impressive predisposing factor in the development of breast cancer. The lesion is more common in the nullipara by nearly 2 to 1. Cessation of lactation produces a more profound and complete involutional effect on the human breast than any other factor. In keep-

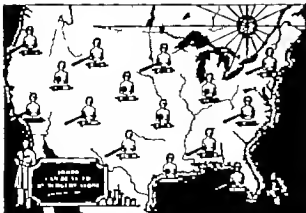


Fig. 4. Ten thousand (of the 5,000) can be saved by surgery alone, while the lesion is confined to the breast.

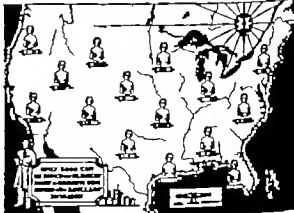


Fig. 5. Only 6,000 can be saved after the axillary nodes are involved.

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other operation in surgery in which the result is so directly measured by a knowledge of the anatomy and by the thoroughness and precision of its performance.

X ray and radium are purely ancillary and in no way competitive in the therapy of mammary carcinoma. Cancer of the breast is not radiosensitive nor radioresponsive. All breast cancers (except anaplastic) are radioresistant. Preoperative x ray therapy has been generally abandoned. It did not add to the 5 year 'cures'. It greatly increased the blood loss during the radical operation because of perivascular fibrosis which condition also interfered with the thoroughness of the dissection. Also the incidence and degree of lymphedema of the arm was greatly increased by it. As for postoperative x ray therapy too much has always been expected of it by too many. It is not a substitute for nor an excuse for an incomplete radical dissection. There are three schools of thought regarding postoperative x ray therapy (1) those who do not advise it at all (2) those who advise its use only when axillary nodes are found involved and (3) those who employ it routinely.

All of these groups are composed of both roentgenologists and surgeons sometimes one leading and the other following and vice versa. The first group says in substance 'If the radical operation has been well done what is there to treat? It is like shooting at the hole before the rat pokes his head out, etc. The answer to this group is one word—implants. It has always been my contention that local recurrence in scar or skin flaps is due to implantation of cancer cells by the operator during the operation. By using an antiseptic technique, thin skin flaps and postoperative x ray therapy we have been able to reduce our local recurrences to less than 1 per cent. As high as 27 per cent have been reported in some clinics. The second group—those who advise postoperative x ray therapy only when axillary nodes are involved—apparently presuppose that all the nodes were possibly not removed. It is rare for experienced surgeons to leave nodes and one rarely sees recurrence in the axilla among experienced operators. This policy would seem to shift some of the responsibility from the surgeon—where it all should remain

and on the other hand could possibly be an excuse for a less meticulous radical dissection. We have all heard surgeons say, 'If there is any cancer left the x ray will take care of it. If carcinoma is left in lymph nodes and only 25 per cent can be sterilized by x ray no one should depend on that. As for the third group, those who advise routine postoperative x ray therapy it is unfortunate that a standard rational basis for this plan has not been agreed upon and advocated. I have for many years, advised routine postoperative x ray therapy on the basis that we can and often do accomplish two desiderata i.e. destroy implanted cancer cells thereby avoiding or reducing local recurrences second destroy cancer cells already seeded in the mediastinal pathway en route to hilar nodes and lungs. On this basis we have advocated two different plans of treatment. Believing that implantation can arise only from two possible sources the biopsy site or from the nodes if they are involved and that seeding into the mediastinal lymphatics can occur with or without node involvement, the plan of treatment is varied according to presence or absence of nodes, and in both plans of treatment deep therapy to the mediastinum is included. If no nodes are involved, a superficial soft tissue technique is mapped out, using four portals axillary suprascapular and upper incision middle and lower part of incision mediastinum. To the first three fields are given, tangentially 200 roentgens each time six times to each field a total of 1200 rat units to each. The factors are 140 kilovolts, 3 millimeters aluminum 50 centimeter target distance, 15 by 15 centimeter portals 20 milliamperes 5 1/2 seconds. To the mediastinal pathway deep therapy is given alternating with the other ports and using for the mediastinum 200 to 220 kilovolts, 312 rat units per treatment, 50 to 60 centimeter target distance, 0.5 to 1 millimeter copper filter every fifth day up to about 2100 roentgens.

In the group with node involvement the usual fractionated deep therapy is given using 5 portals suprascapular axillary breast area and center of scar lower incision mediastinum. The same factors and dosage are used to each of these portals as is given to the mediastinum as noted above.

TABLE II.—EFFECT OF EXTENT OF AXILLARY METASTASES ON SURVIVAL*

	Cases	Living and well 5 yrs per cent	Living and well 1-4 yrs per cent	Average survival of those dead of disease years
No metastases to axillary lymph nodes	81	81	76	4.7
Metastases involving less than half the axillary lymph nodes	31	64	54	4.6
Metastases involving more than half the axillary lymph nodes	31	29	27	3.4
Metastases involving all axillary lymph nodes	17	9	14	
Total with metastases to axillary lymph nodes	90	38	34	3
Total	7	66	70	3.2

tion has been done to determine whether tumor susceptibilities in mice besides mammary carcinoma are transferred through breast milk. The results have been negative. There is no evidence of any kind even to suggest that the milk factor is in any way applicable to the human. Surveys are now under way at the University of Minnesota and the University of Ohio which, in a decade, may give us some light on this possibility. Although not directly inducing the disease, the possibility of the milk factor being a virus has greatly revived and stimulated interest in the virus theory of tumors. With the new electron microscope and the recently developed ultraviolet lighting method (Casper of Sweden) amazing and beautiful pictures have been made from thin tissue cultures showing not only cell fission and mitosis but clearly showing the virus in the cell protoplasm. By these methods, virus has been demonstrated clearly in the cells of chicken sarcoma, in the large papillomas of the Western cotton tail rabbit and in the cells of

TABLE III.—RELATION OF LYMPH NODE METASTASES TO RECURRENCES IN THE OPERATIVE SCAR

Cases	Metastases to axillary lymph nodes per cent	Recurrences in operative scar per cent
8		7
	under 50	0
3	over 50	9
17	100	21

*Tables II and III appeared in Tables I and II in article by Eklöf, Warren and V. N. Tompkins, *Surg. Gyn. Obst.*, 1941, 72: 327-330.

hypernephroma to which the leopard frog of the marshes is so susceptible.

TREATMENT

In the treatment of breast cancer radical operation holds first place. The percentage of 5 year cures and the duration of life of those not cured are inversely proportional to the percentage of node involvement (Tables II and III). This is the most significant single fact for consideration in the therapy of breast cancer and the fact that makes the thorough, meticulous, systematized radical dissection of paramount importance.

For the past 24 years in my breast clinic, it has been my custom to count the nodes removed, to determine the percentage of malignant involvement and note their location. The radical operation is done in such a way that the layers of fascia can be spread out in sheets, and the nodes counted by hand lens and palpation by the pathologist. The layers are numbered and the number of nodes, per cent involved, and location are included in the pathologist's report. Thus we have found not only of definite prognostic value but a practical guide in the after care and follow up of individual cases.

Every now and then all of us are confronted in consultation or in conference by a medical man or a surgeon who states that the radical operation is unnecessary, that just as good results can be obtained with simple mastectomy plus x ray therapy. This statement should be immediately challenged and vigorously refuted. To accept it is to set breast surgery back more than 80 years to the time before Charles Hewitt Moore (the father of modern breast surgery). The facts are that x ray will sterilize the breast in only one third—33 per cent. When cancer is confined to the breast the radical operation gives 70 to 80 per cent 5 year cures. X ray will sterilize involved axillary nodes only in 1 out of 4—25 per cent. The results of radical operation in those cases with axillary node involvement is 48 per cent 5 year cures. At present, radical operation certainly represents our best and most reliable means of combating this disease and whatever disrepute has fallen upon it is most often due to the hurried incomplete performance of it. There is no

other operation in surgery in which the result is so directly measured by a knowledge of the anatomy and by the thoroughness and precision of its performance.

X ray and radium are purely ancillary and in no way competitive in the therapy of mammary carcinoma. Cancer of the breast is not radiosensitive nor radioresponsive. All breast cancers (except anaplastic) are radioresistant. Preoperative x ray therapy has been generally abandoned. It did not add to the 5 year 'cures.' It greatly increased the blood loss during the radical operation because of perivascular fibrosis which condition also interfered with the thoroughness of the dissection. Also the incidence and degree of lymphedema of the arm was greatly increased by it. As for postoperative x ray therapy too much has always been expected of it by too many. It is not a substitute for nor an excuse for an incomplete radical dissection. There are three schools of thought regarding postoperative x ray therapy (1) those who do not advise it at all (2) those who advise its use only when axillary nodes are found involved and (3) those who employ it routinely.

All of these groups are composed of both roentgenologists and surgeons, sometimes one leading and the other following and vice versa. The first group says in substance: If the radical operation has been well done what is there to treat? It is like shooting at the bole before the rat pokes his head out etc. The answer to this group is one word—implants. It has always been my contention that local recurrence in scar or skin flaps is due to implantation of cancer cells by the operator during the operation. By using an antiseptic technique thin skin flaps and postoperative x ray therapy we have been able to reduce our local recurrences to less than 1 per cent. As high as 27 per cent have been reported in some clinics. The second group—those who advise postoperative x ray therapy only when axillary nodes are involved—apparently presuppose that all the nodes were possibly not removed. It is rare for experienced surgeons to leave nodes and one rarely sees recurrence in the axilla among experienced operators. This policy would seem to shift some of the responsibility from the surgeon—where it all should remain

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In the group with node involvement the usual fractionated deep therapy is given using 5 portals: suprascapular, axillary, breast area and center of scar, lower incision, mediastinum. The same factors and dosage are used to each of these portals as is given to the mediastinum as noted above.

In the treatment of inoperable carcinoma of the breast, simple mastectomy x ray therapy and testosterone are our mainstays—simple mastectomy to avoid or get rid of a foul sloughing mass and improve the patient's condition and morale x ray and testosterone for palliation. It is amazing what can be done in relief and prolongation of life, and here, x ray therapy really comes into its own and most of us frequently find ourselves with a few of our inoperables comfortably outliving some of our 5 year cures.

Castration in the therapy of breast cancer has much more historical interest than practical value. The most that can be said for it is that it has slight temporary effect for a short time in a few cases. In fact the effect of castration is slight and inconsequential compared to the involution caused by cessation of lactation. But ever so often since Schunzinger suggested castration for breast cancer in 1889 and since its performance in 8 cases by Beatson in 1896 it has been revived, tried and abandoned again and again. All the statistical evidence by a comparison of series large and small with and without castration shows it to be of little or no value. If it has any value at all it is in cases of diffuse and advanced bone metastases with high alkaline serum phosphatase. X ray and testosterone however will do more for these cases than x ray and castration. Castration has been advocated to prevent pregnancy to protect the remaining breast, to prevent local recurrences and distant metastases. Pregnancy can be satisfactorily controlled with modern contraceptives. Tubal ligation is justifiable if other methods are objectionable. Surely no woman who has had a radical operation or other treatment for breast cancer should be allowed to become pregnant. The fate of the remaining breast is largely in the hands of the surgeon who does the radical operation. If he removes all the prestermal fascia and destroys the superficial transmammary pathway the remaining breast is safe because this is the only direct lymphatic connection. Remembering that 2 per cent of breast cancer is initially bilateral, and that 5 per cent will become bilateral this is an important consideration. As for local recurrences, they can to a large extent be avoided, and as for distant

metastases, they have usually been seeded before operation although not demonstrable by examination or x ray. Postoperative x-ray therapy especially to the mediastinum, is our only defense. In the middle 1930's, when x ray therapy was having its revival in the treatment of breast carcinoma, both in the Scandinavian clinics and in the United States, castration by x ray was added to the preoperative therapy. This entire plan has been discarded having been found to be of no help and to have many disadvantages.

In cancer of the male breast castration is much more beneficial and the results far more striking. In fact the male, having no such compensatory gonadal mechanism, the results are comparable to or even surpass those seen in carcinoma of the prostate. In all advanced breast cancer in the male especially with bone metastases, it is a valuable addition to the therapy.

Carcinoma of the breast during pregnancy presents a serious and often hazardous problem. The changes in the breast preparatory to lactation the enormous increase in glandular and ductular elements, the increased blood supply and the increased stimulation both by estrin and prolactin all make for rapid fulminant growth. Also the type and grade of cancer is usually duct or adenocarcinoma, grade 2 or 3. This fact adds to the rapid advance. No progress can be expected in the arrest or treatment of the breast lesion while the pregnancy exists. If it is less than 5 months and the breast lesion is still operable the pregnancy should be interrupted at once testosterone given daily in large doses and the radical operation with adequate transfusions should be done as soon as the patient's condition permits. If the pregnancy is beyond 5 months and the breast lesion operable, hysterotomy tubal ligation transfusions and radical operation should be the plan. Testosterone will be of great value but castration should be avoided because it will destroy the balance between estrin and prolactin and the resultant pituitary ascendancy will increase lactation or the preparation therefor.

In the late weeks of pregnancy if the breast lesion is operable cesarean section with an attempt at a viable child should be followed as

soon as possible with the radical operation transfusions, testosterone etc. If the lesion is frankly inoperable a week or two of added fetal maturity may be permissible the delivery to be followed by simple mastectomy, testosterone and x ray therapy. Each case should be carefully analyzed and individualized the question of operability and the saving of the mother by the radical operation being the primary consideration and the question of a viable child coming into first consideration only in the late weeks or in the obviously inoperable.

Special problems in the therapy of mammary carcinoma are also presented by Volkmann's inflammatory carcinoma (mastitis carcinosa), anaplastic carcinoma of the breast and perhaps by duct carcinoma in young women.

In mastitis carcinosa, the brawny red edematous crabspeckled lesion not only spreads rapidly along the superficial lymphatics but quickly penetrates the breast through the interlobular lymphatics to involve the pectorals and fascia. Growth and penetration are usually so rapid that the lesion is soon beyond the hope of surgery which spreads the disease and hastens the end the average duration of life being 6 to 8 months. The widespread involvement often results in cancer *en cuirasse*. If seen early the best palliative procedure is interstitial radiation the so called radical radium needling (Keynes pattern).

Anaplastic carcinoma of the breast is often badly handled surgically with poor results. By the time the nodule reaches palpable size bone metastases have occurred in many instances, but fortunately both the primary lesion and the bone metastases are highly radiosensitive and radiotherapy is the treatment of choice. This is the only radioresponsive breast lesion.

Duct carcinoma in young women deserves special mention because of the pessimism and defeatist attitude regarding mammary cancer in the young. For this attitude there is no basis. Only 2 per cent of breast carcinoma occurs before 30 years of age and the best results of radical operation are obtained from 35 to 50 years of age. The points that should be stressed in the younger group are two. This is the age of active cyclic changes in the breast

and of fibrocystic disease and these women are more likely to become victims of cancer. Second young women with active breasts usually develop one of the more rapidly growing types of cancer—adenocarcinoma or duct carcinoma grading 2 or 3—and not sarcoma. Early diagnosis is imperative but while still operable the results compare favorably with the same type and grade in the older group. If testosterone has any place in prophylaxis against recurrence after radical operation it is in these young women with grade 2 or 3 growths. Castration should be avoided. It will give the whip hand to the pituitary by removing its biologic antagonist, estrin. Prolactin the luteotrophic hormone of the pituitary is much more to be feared. Testosterone will suppress it most satisfactorily.

CAUSES OF FAILURE

Although the facts and figures definitely justify an optimistic realism in the problem of breast carcinoma, it is always of value and interest to review our causes of failure critically.

1 Late diagnosis. Early diagnosis will alone save 4,000 additional lives in the United States each year (Fig. 5).

2 Failure to recognize inoperability as follows: (a) supraclavicular nodes (b) fixation of axillary nodes (c) fixation of the breast on chest wall (d) distant metastases, to lung, liver, bones (e) widespread parietal dissemination—diffuse secondary subcutaneous nodules (f) mastitis carcinosa Volkmann's inflammatory carcinoma (g) cancer *en cuirasse* (h) anaplastic carcinoma (i) incurable constitutional diseases which may lead to fatality. This is particularly in the aged group cardiac, cardiorenal etc. in which the radical operation would be hazardous, and the life expectancy with simple mastectomy would equal that of the complicating disease.

Under inoperability we should frankly discuss the one most discouraging feature of breast surgery the factor which I have for many years, called *preceding* to emphasize its importance to my graduate students. We have found in our follow up clinics, that in spite of careful preoperative examination which routinely includes an x ray survey of chest, spine, ribs and pelvis in 11 per cent of

our cases the patient returns within 2 years with a distant metastasis which must have been seeded prior to the radical operation. This *preseeding* gives no clue whatever of its existence either in symptoms, physical signs, or x ray evidence. Its possibility always exists. The more advanced the lesion the greater the percentage of node invasion the more of a possibility it becomes. It can and does occur without axillary node involvement although infrequently. This is not surprising if we recall that 4 of the 8 pathways of spread do not traverse the nodes (mediastinal transmammary epigastric, superficial abdominal). The discouraging feature is that we are almost defenseless against *preseeding*. Our only defense is x ray therapy to the mediastinum as a part of our routine postoperative program. All 4 of the other outside pathways are included in the x ray therapy fields as a routine measure.

3 Inadequate and incomplete radical operation. Unfortunately some surgeons, although skilled in their fields, seem to regard the radical breast dissection as just another operation

a task to be quickly completed. Speed has no place in this work. Others, engrossed in anatomical and technical detail, take no precaution whatever against implantation. Unless one is cancer cell minded disastrous consequences follow. Other common errors of technique are failure to remove the superficial fascia from the skin flaps and to remove the epigastric and subscapular node groups.

4. Pessimism and defeatism as a cause of failure, are not justified by the facts and figures and are too often due to a lack of knowledge of them. There is no place in breast surgery for the defeatist and nothing to support him.

SUMMARY

Although cancer of the breast is increasing annually the cure rate is increasing more rapidly than the incidence. "Fight Cancer with Knowledge" can be applied to the medical profession as well as to the laity. Nowhere in the realm of surgery is it so true that "Knowledge is Power" as it is in breast cancer and in this instance it often means power to save lives.

LABORATORY AND CLINICAL EXPERIENCES WITH STREPTOMYCIN THERAPY IN THE MANAGEMENT OF INFECTIONS OF INTESTINAL ORIGIN

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DURING the past 6 months careful clinical and laboratory studies have been made on 13 patients with serious intra abdominal infections who have received streptomycin therapy (Table I). Five were patients with acute diffuse peritonitis, 6 had intra abdominal abscesses, 1 acute cholangitis and 1 an abscess of the liver. Streptomycin was given by intramuscular injection at 3 hour intervals in all cases. The patients with diffuse peritonitis each received from 24 to 52 grams of streptomycin over periods of 8 to 14 days (2.7 to 4 grams daily). The other patients each received from 15 to 48 grams of streptomycin over periods of 5 to 16 days (3 to 4 grams daily). Other chemotherapy was discontinued during the period of treatment with streptomycin in all except 2 cases, in which penicillin and streptomycin were given concurrently. Since most of these patients were seriously or critically ill with infection they received, in addition to the chemotherapy, supportive fluids and transfusions, continuous aspiration of the stomach and upper intestinal tract when necessary, and surgical procedures for removal or drainage of septic foci when indicated.

CASE 1. After an acute illness of 30 hours duration a woman 33 years of age was found to have a diffuse peritonitis originating from a gangrenous perforated appendix. Appendectomy with drainage of the abdominal wound was done. Bacteria cultured from the peritoneal exudate were *Escherichia coli* and beta hemolytic streptococci. These organisms were susceptible *in vitro* to 4 to 5 units of streptomycin per cubic centimeter (a concentration within the blood streptomycin level obtained with the dosage used). Streptomycin therapy was started immediately after operation. The patient received 24 grams

of streptomycin over a period of 9 days (2.7 grams daily). The patient convalesced satisfactorily. She became afebrile on the 6th postoperative day and the wound healed without infection by the 14th postoperative day. It is possible but doubtful that streptomycin therapy contributed to the recovery of this patient.

CASE 2. After an acute illness of 36 hours duration a man 18 years of age was found to have a diffuse peritonitis originating from a gangrenous perforated appendix. Appendectomy was performed. Bacterial cultures made from the peritoneal exudate contained *Escherichia coli* and staphylococci (type). *In vitro* these organisms were resistant to streptomycin in concentrations up to 150 units per cubic centimeter (a concentration considerably above the blood levels obtainable with the dosage and method of administration used). The patient received 33.4 grams of streptomycin over a period of 8 days (3 grams daily). All symptoms of diffuse peritonitis subsided rapidly. The patient was afebrile by the 5th postoperative day and the abdominal wound healed without infection in 12 days. It appears unlikely that streptomycin contributed to recovery in this case.

CASE 3. A man 67 years of age gave a history of lower abdominal pain of 15 hours duration and showed signs of peritonitis. Laparotomy revealed a perforated diverticulum of the sigmoid colon and diffuse peritonitis. Three hours after operation streptomycin therapy was started. He received 27 grams (2.7 grams daily) over a period of 10 days. Unfortunately the culture tube was broken so that bacteriological data could not be obtained. Postoperatively the patient remained acutely ill and febrile and the laparotomy incision became infected. After 10 days streptomycin therapy was discontinued and penicillin and sulfonamide therapy started. Within 12 hours after therapy was changed the patient was afebrile. Obviously streptomycin therapy was of no value in this case.

CASE 4. An elderly woman was acutely ill for 16 days with generalized abdominal pain, vomiting and jaundice. Chemotherapy with penicillin and sulfadiazine had no appreciable effect on the course of her illness. She appeared moribund. Streptomycin therapy was started, 4 grams daily being given. After 24 hours of streptomycin treatment the patient's condition improved remarkably and an operation was performed. A diffuse peritonitis due to perforation of the common bile duct by a calculus was found. Bac

From the Department of Experimental Surgery of the University of California Medical School. This project received financial support from the Christine Breon Fund. Presented in the Forum on Fundamental Surgical Problems before the Clinical Congress of the American College of Surgeons, December 1946.



Fig. 1 Diagram indicating method of producing diffuse experimental peritonitis of appendiceal origin. The vascular supply is divided, the base of the appendix is ligated, the appendix is crushed, and the spleen and omentum are removed.

there was purulent drainage from the laparotomy wound. Bacterial cultures contained *Escherichia coli* (susceptible to 285 units of streptomycin per cubic centimeter) and a nonhemolytic *Staphylococcus aureus* (susceptible to 200 units of streptomycin per cubic centimeter). He was given 3 grams of streptomycin daily for 10 days (a total of 30 grams). During this course of treatment the patient's condition improved and the drainage from the wound ceased. However, this result must be considered to be doubtful because the patient had previously had many similar remissions with temporary closure of the wound.

CASE 10. A 25 year old woman had been acutely ill with tubo-ovarian abscesses for 4 months. In spite of two operations for drainage of abscesses she remained acutely febrile and became progressively worse. Cultures made from the abscesses contained *Escherichia coli* nonhemolytic *Staphylococcus albus*, *Pseudomonas aeruginosa* and alpha hemolytic strep-

tococcus. She was treated with 3 grams of streptomycin daily for 16 days (a total of 48 grams). The *Escherichia coli* and *Pseudomonas aeruginosa* disappeared from her cultures but the clinical course of the disease continued progressively downhill. Streptomycin therapy did not help in this case.

CASE 11. A woman 48 years old developed a pelvic peritonitis and abscess after repair of a rectovaginal fistula. Bacterial cultures contained hemolytic *Staphylococcus albus*. She had been acutely ill and febrile for 14 days before streptomycin therapy was started. She received 3 grams of streptomycin daily for 14 days (a total of 42 grams). Her temperature dropped from 103 degrees F. to normal during streptomycin therapy. Streptomycin therapy may have been helpful in this case but it is doubtful.

CASE 12. A man 47 years of age had a history of many episodes of acute cholangitis following an operation for removal of stones from the common bile duct. He entered the hospital with an attack of up-

TABLE I—CLINICAL USE OF STREPTOMYCIN

Case	Diagnosis	Source of Infection	Bacteriology	Amount of streptomycin, gm	Effects of streptomycin
	Diffuse peritonitis	Perforated acute appendicitis	<i>Escherichia coli</i> , beta hemolytic streptococcus	24	Doubtful, but possibly beneficial
	Diffuse peritonitis	Perforated acute appendicitis	<i>Escherichia coli</i> , staphylococcus type undetermined	23	Doubtful
	Diffuse peritonitis	Sigmoid diverticulitis	No cultures obtained	27	Of no value
	Diffuse peritonitis	Perforated common bile duct	<i>Escherichia coli</i> , proteus vulgaris, streptococcus (alpha)	36	Probably beneficial
1	Diffuse peritonitis	Perforated aseptic ulcer of colon	No cultures obtained	53*	Possibly beneficial
6	Abdominal abscess (pelvic)	Colon resection with anastomosis	No cultures obtained	24	Of no value
	Abdominal abscess	Colon resection with anastomosis	<i>Escherichia coli</i> , beta hemolytic streptococcus, alpha hemolytic streptococcus	33	Of no value
8	Abdominal abscess	Regional ileitis	<i>Escherichia coli</i> , streptococcus viridans, clostridium welchii	36	Doubtful
	Abdominal abscess	Sigmoid diverticulitis	<i>Escherichia coli</i> , nonhemolytic staphylococcus	30	Doubtful
10	Abdominal abscess	Pelvic inflammatory disease	<i>Escherichia coli</i> , nonhemolytic staphylococcus albus, alpha hemolytic streptococcus	8	Of no value
	Abdominal abscess (pelvic)	Repair of rectovaginal fistula	Beta hemolytic staphylococcus albus	4	Doubtful, but possibly beneficial
	Acute cholecystitis	Common bile duct stricture	No cultures obtained	15*	Doubtful
	Pelvic abscess	Hemorrhoids	Beta hemolytic streptococcus, <i>Bacteroides</i>	24	Doubtful

*Combined with penicillin therapy.

tenological cultures made from the peritoneal exudate showed the presence of *Escherichia coli*, *Proteus vulgaris*, and *Streptococcus fecalis*. *In vitro* laboratory determination indicated that the *Escherichia coli* and *Streptococcus fecalis* were susceptible to concentrations of 40 units of streptomycin per cubic centimeter and the *Proteus vulgaris* was susceptible to 20 units of streptomycin per cubic centimeter. A total of 36 grams of streptomycin was given over a period of 9 days. The patient recovered. Streptomycin therapy probably was beneficial in this case.

CASE 5. A woman 35 years of age had been ill with amebic colitis for 3 weeks when she suddenly developed severe abdominal pain and signs of diffuse peritonitis. It was believed that she had a perforation of an amebic ulcer of the colon. She had been acutely ill with peritonitis for 5 days and appeared moribund before antibiotic therapy was started. No cultures were obtained. She received 4 grams of streptomycin and 400,000 units of penicillin daily for 14 days. She improved slowly and recovered. Streptomycin therapy may possibly have been of some value in this case.

CASE 6. A woman 40 years of age developed a pelvic abscess after resection and anastomosis of the pelvic colon. She was febrile and acutely ill for 15 days before streptomycin therapy was begun. She received 3 grams of streptomycin daily for 8 days, a total of 24 grams, without apparent benefit. After a colostomy and surgical drainage of the abscess were

done she recovered rapidly. Streptomycin therapy obviously had effect in this case.

CASE 7. A 66 year old man developed an abdominal abscess with a draining wound 3 months after resection and anastomosis of the colon. Cultures contained *Escherichia coli* (susceptible to 7.1 units of streptomycin per cubic centimeter), beta hemolytic streptococcus (susceptible to 2.5 units of streptomycin per cubic centimeter) and alpha hemolytic streptococcus (susceptible to 0.2 unit per cubic centimeter). He had been ill for 3 months when streptomycin therapy was instituted. He was given 3 grams of streptomycin daily for 11 days (a total of 33 grams) without apparent benefit.

CASE 8. A 35 year old woman had been ill with regional ileitis for 7 years. An operation was performed for resection of the diseased intestine and drainage of abdominal abscesses. Bacterial cultures demonstrated *Escherichia coli*, *Streptococcus viridans*, and *Clostridium welchii*. Streptomycin therapy was started on the first postoperative day. Four grams of streptomycin were given daily for 9 days (a total of 36 grams). The patient became afebrile in 3 days. Wound drainage diminished rapidly and the wound closed in 10 days. It is doubtful that streptomycin contributed to recovery in this case.

CASE 9. A man 44 years of age was found on exploratory laparotomy to have an abdominal abscess associated with diverticulitis of the sigmoid colon. Six months later the abscess was still present and

Miscellaneous

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Fig. 1. Diagram indicating method of producing diffuse experimental peritonitis of appendiceal origin. The vascular supply is divided, the base of the appendix is ligated, the appendix is crushed and the spleen and omentum are removed.

there was purulent drainage from the laparotomy wound. Bacterial cultures contained *Escherichia coli* (susceptible to 285 units of streptomycin per cubic centimeter) and a nonhemolytic *Staphylococcus aureus* (susceptible to 2000 units of streptomycin per cubic centimeter). He was given 3 grams of streptomycin daily for 10 days (a total of 30 grams). During this course of treatment the patient's condition improved and the drainage from the wound ceased. However, this result must be considered to be doubtful because the patient had previously had many similar remissions with temporary closure of the wound.

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tococcus. She was treated with 3 grams of streptomycin daily for 16 days (a total of 48 grams). The *Escherichia coli* and *Pseudomonas aeruginosa* disappeared from her cultures, but the clinical course of the disease continued progressively downhill. Streptomycin therapy did not help in this case.

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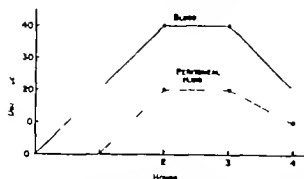


Fig. 8. Blood and peritoneal streptomycin level following single intramuscular dose of 0.33 gram of streptomycin (dog).

per abdominal pain, chills (100°C) and icterus of 48 hours duration. Blood cultures produced no bacterial growth. Penicillin therapy was given for 1 day pending the arrival of streptomycin. On the third day of his illness a few hours after his temperature had subsided to normal streptomycin therapy was started. He received 3 grams of streptomycin daily for 3 days (total amount 15 grams). The patient recovered completely from this attack of cholangitis but improvement began a few hours before streptomycin therapy was started; therefore, its value in this case must be considered as doubtful.

CASE 13. A man 48 years of age had been ill for 2 months with chills, fever, sweats and upper abdominal pain. An abscess of the liver was drained and bacterial cultures of the pus contained beta hemolytic streptococcus and *Bacteroides* (*in vivo* tests indicated resistance of these organisms to streptomycin in concentrations as high as 2,000 units per cubic centimeter). After drainage of the abscess, the patient was given 3 grams of streptomycin daily for a period of 8 days (a total of 24 grams). The *Bacteroides* soon disappeared but the streptococcus persisted for some time in the cultures. The patient re-

TABLE II.—STREPTOMYCIN SUSCEPTIBILITY OF BACTERIA CULTURED FROM PERITONEAL EXUDATE OF ANIMALS WITH EXPERIMENTAL PERITONITIS OF APPENDICEAL ORIGIN

Organism	Effective concentration of streptomycin (units/cc.)
<i>Lactobacillus coli</i>	75-30
<i>Proteus vulgaris</i>	7-50.0
<i>Bacteroides</i>	Not susceptible
<i>Anaerobic sporeforming bacillus</i>	3
<i>Pseudomonas aeruginosa</i>	Not susceptible
<i>Clostridium</i>	Not susceptible
<i>Alpha hemolytic streptococcus</i>	Most strains not susceptible
<i>Beta hemolytic streptococcus</i>	3-25.5
<i>Gamma streptococcus</i>	3-37
<i>Streptococcus fecalis</i>	Not susceptible
<i>Nonhemolytic staphylococcus albus</i>	3.57-30.0
<i>Hemolytic staphylococcus albus</i>	4.6
<i>Hemolytic staphylococcus aureus</i>	3.0-8.0

TABLE III.—EXPERIMENTAL PERITONITIS—UNTREATED CONTROL SERIES

Number of animals	10
Survived	0
Died	10 hours
Average period of survival	
Bacteria cultured	Number of animals (incubated)
<i>Lactobacillus coli</i>	10
<i>Proteus vulgaris</i>	
<i>Bacteroides</i>	1
<i>Clostridium</i>	1
<i>Alpha hemolytic streptococcus</i>	3
<i>Beta hemolytic streptococcus</i>	1
<i>Streptococcus fecalis</i>	3
<i>Nonhemolytic staphylococcus albus</i>	3
<i>Hemolytic staphylococcus albus</i>	3
Neurophy findings	diffuse peritonitis in all animals

covered completely. It appears doubtful that streptomycin therapy was helpful in this case.

It was difficult to evaluate, from these clinical studies, the effect of streptomycin therapy on intra abdominal infections. In order to obtain more information regarding the value of streptomycin a group of surgical laboratory experiments was undertaken.

Fulminating diffuse peritonitis was produced in dogs by a modification of the method of Bower described previously (8). This consisted of dividing the blood supply to the appendix, ligating the base with umbilical tape, crushing the wall of the appendix and removing the omentum and spleen (Fig. 1) and administering 60 cubic centimeters of castor oil by gavage. All animals received supportive therapy consisting of parenteral fluids and electrolytes throughout the postoperative period. A small soft rubber tube was brought out through the abdominal incision from which peritoneal fluid was withdrawn for bacterial cultures, and in two groups of animals streptomycin was instilled locally through these tubes. In most of the animals the tubes functioned satisfactorily but occasionally the animal would withdraw the tube before the experiment was completed. *In vitro* streptomycin susceptibility tests of bacteria cultured from the peritoneal exudate of animals with experimental peritonitis are shown in Table II. Thirty-five animals were used for the experiment. Ten served as untreated controls, 10 animals received systemic streptomycin therapy beginning 6 hours postoperatively and 10 received local streptomycin

TABLE IV—EXPERIMENTAL PERITONITIS—SYSTEMIC STREPTOMYCIN THERAPY BEGUN 6 HOURS POSTOPERATIVELY

Dosage—33 gram of streptomycin intramuscularly every 4 hours—2.0 grams daily	
Number of animals	10
Survived	9
Died	1
Average period of survival	92 hours

*One animal developed fecal fistula apparently after surviving the original period of acute diffuse peritonitis.

Bacteria cultured	6 hours postoperative therapy (7 animals)	At necropsy (9 animals) (Incidence)
<i>Escherichia coli</i>	6	9
<i>Enterococcus vulgaris</i>	0	0
<i>Bacteroides</i>	1	0
<i>Aerobic sporeforming bacillus</i>	1	2
<i>Clostridium</i>	5	8
<i>Alpha hemolytic streptococcus</i>	2	1
<i>Beta hemolytic streptococcus</i>	2	4
<i>Gamma streptococcus</i>	2	1
<i>Streptococcus fecalis</i>	1	2
<i>Nonhemolytic staphylococcus albus</i>	2	2
<i>Hemolytic staphylococcus albus</i>	1	1
<i>Hemolytic staphylococcus aureus</i>	1	1
Necropsy findings	Diffuse peritonitis in all animals that died	

therapy The animals receiving systemic streptomycin therapy were given 2 grams of streptomycin daily (33 gram every 4 hours) by the intramuscular route. Figure 2 shows relative blood and peritoneal streptomycin levels following a single intramuscular dose of 0.33 gram of streptomycin.

All of the 10 untreated control animals died with diffuse peritonitis. The average period of survival was 39 hours. The organisms cultured from the peritoneal fluid of the untreated control series are shown in Table III.

Of the group of 10 animals that received systemic streptomycin therapy beginning 6 hours postoperatively 9 died and 1 survived. One of the animals that died apparently survived the period of acute diffuse peritonitis but developed a fecal fistula with overwhelming infection. The average period of survival of the animals that died with diffuse peritonitis was 3 days 20 hours. It is interesting that the bacterial organisms cultured from the peritoneal fluid 6 hours after the onset of peritonitis generally were the same types and in roughly similar proportion to those cultured from the peritoneal fluid at necropsy (see Table IV).

TABLE V—EXPERIMENTAL PERITONITIS—SYSTEMIC STREPTOMYCIN THERAPY BEGUN IMMEDIATELY POSTOPERATIVELY

Dosage—33 gram of streptomycin intramuscularly every 4 hours—2.0 grams daily	
Number of animals	5
Survived	0
Died	5
Average period of survival	75 hours

Bacteria cultured	6 hours postoperative therapy (4 animals) (Incidence)	At necropsy (5 animals) (Incidence)
<i>Escherichia coli</i>	2	3
<i>Bacteroides</i>	0	1
<i>Clostridium</i>	3	4
<i>Alpha hemolytic streptococcus</i>	0	0
<i>Beta hemolytic streptococcus</i>	1	0
<i>Gamma streptococcus</i>	1	0
<i>Streptococcus fecalis</i>	2	3
<i>Nonhemolytic staphylococcus albus</i>	2	0
<i>Nonhemolytic staphylococcus aureus</i>	1	0
<i>Diphtheroid bacillus</i>	2	0

Necropsy findings: Diffuse peritonitis, all animals.

All of the 5 animals that received systemic streptomycin therapy beginning immediately after the operation to produce diffuse peritonitis died. The average period of survival was 3 days 3 hours and the bacterial cultures from the peritoneal fluid 6 hours after operation were roughly similar to those made from the peritoneal fluid at necropsy (see Table V).

TABLE VI—EXPERIMENTAL PERITONITIS—INTRAPERITONEAL STREPTOMYCIN (NO SYSTEMIC THERAPY GIVEN)

Dosage—0.4 gram of streptomycin given intraperitoneally twice daily the first postoperative day and once daily thereafter.

Number of animals	5
Survived	0
Died	5
Average period of survival	87 hours

Bacteria cultured	Hours postoperative (4 animals)					Necropsy (5 animals)
	6 hours	30 hours	48 hours	72 hours		
	(Incidence)					
<i>Escherichia coli</i>						4
<i>Clostridium</i>	3	3	4	4		5
<i>Alpha hemolytic streptococcus</i>						4
<i>Gamma streptococcus</i>						—
<i>Streptococcus fecalis</i>						—
<i>Nonhemolytic staphylococcus aureus</i>						—

Necropsy findings: Diffuse peritonitis.

All animals receiving systemic streptomycin therapy were acutely ill and toxic. Their appearance was identical with that of the untreated control animals.

Five animals received 0.4 gram of streptomycin intraperitoneally (through a small rubber tube) twice on the day of operation and once daily thereafter. All 5 animals died of diffuse peritonitis. The average period of survival was 3 days 15 hours. The bacterial flora was not significantly altered by this therapy (see Table VI).

Five animals received intraperitoneal instillations of 4.0 grams of streptomycin beginning immediately after operation twice on the day of operation and at 24 hour intervals thereafter. Bacterial cultures made after a period of 6 hours and again at necropsy indicated that doses of 4.0 grams intraperitoneally effectively sterilized the peritoneal fluid in 4 of 5 animals. Cultures of the peritoneal fluid of the remaining animal showed the presence of *Escherichia coli* and *Clostridium welchii*. However animals treated with such large doses of streptomycin intraperitoneally in variably died of streptomycin intoxication with respiratory failure, apparently of central origin.

SUMMARY

A group of 13 patients with serious intra-abdominal infections was treated with systemic streptomycin therapy. The result of streptomycin therapy was believed to be probably beneficial in 1 case, possibly beneficial in 1 case, doubtful but possibly helpful in 2, of doubtful value in 5 and of no value in 4 cases.

In a series of animals in which fulminating diffuse peritonitis of appendiceal origin was produced, systemic and local streptomycin therapy in dosages used apparently prolonged the lives of the animals, but did not significantly alter the bacterial flora of the peritoneal exudate or save the lives of the animals.

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THE MICROSCOPIC CRITERIA FOR THE DIAGNOSIS OF EARLY CARCINOMA OF THE CERVIX UTERI

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ONE of the first papers on early non invasive carcinoma of the cervix uteri was written by Rubin and appeared in 1910. It contained the report of 3 cases in which the diagnosis was made by the presence of atypical cells and loss of cellular polarity confined to the surface squamous epithelium. This author reached the conclusion that the diagnosis of early carcinoma depended upon these microscopic cell changes and that a pathological diagnosis of cancer in the preclinical preinvasive stage was possible. Schuller in 1933 described the early malignant changes of squamous epithelium of the cervix uteri as consisting of the presence of nuclei up to the surface of the epithelium the presence of atypical and polymorphic cells especially as regards the nuclei a sharply demarcated basal layer against the underlying connective tissue and a distinct, oblique line of demarcation between the normal and carcinomatous cells. Meyer in 1941 described these changes as an increase of nuclear chromatin enlargement of nuclei loss of regular layering and a 45 degree angle at the junction between normal and carcinomatous tissue. Using epithelium of the skin Broders previously in 1932 had identified the changes of early carcinoma as consisting of an increase in size and irregularity of the cells, more basophilic nuclei atypical mitoses, and occasional grouping of the cells as tumor giant cells. He found that invasion was not necessary for a diagnosis of malignancy.

SELECTION OF MATERIAL FOR STUDY

This study was made by obtaining the cervixes from the microscopic slide files of the laboratory of Woman's Hospital over a period of approximately 10 years, and from the services of Dr. Mark Maun and Dr. Lawrence

Berman of the department of pathology of Wayne University College of Medicine Detroit. Cervices numbering 4,054 were selected from the files of Woman's Hospital which revealed benign lesions including hypertrophy hyperplasia, metaplasia, leucoplakia, parakeratosis, hyperkeratosis, polyps, lacerations, scars, ulcerations, erosions, cervicitis, endocervicitis and so called precancerous changes of the cervix. The stratified squamous epithelium of the portio vaginalis was the particular point of study since it is from this area that 95 per cent of all cervical carcinomas arise.

METHOD OF STUDY

From these 4,054 cases 7 were selected, containing early noninvasive carcinoma. Eight additional cases were obtained from other institutions for a total of 15 cases (Table I). Of these 15 cases 6 of early noninvasive carcinoma also demonstrated early invasive carcinoma in other areas of the same cervix. These 6 cases were included in the study for comparison with the early noninvasive lesions.

The cervixes were studied microscopically for changes in cell morphology of the surface stratified squamous epithelium specifically compared with normal cervixes or cervixes revealing benign lesions. Paraffin section technique and hematoxylin eosin staining were employed. The stage of early squamous cell carcinoma in the preclinical noninvasive stage is thus particularly emphasized. This stage of early carcinoma is referred to by some authors (3) as intraepithelial carcinoma or as carcinoma *in situ* by others (1). In this stage the changes were observed microscopically rather than grossly and were present chiefly in the surface squamous epithelium. No clinical follow up has been pursued to indicate the accuracy of the observations. Only microscopic comparison with early invasive carcinoma and

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TABLE 1—ESSENTIAL PATHOLOGICAL DATA ON THE FIFTEEN CASES STUDIED

Case No.	Designation	Dark on p. nuclei	Cytoplasm de-creased in amount	Non-disturb-able basal layer	Mitoses	Intact basement membrane	Line of demarcation	Lymphatic infiltration (stroma)	Number of cells	Loss of polarity	Invasiveness	Change in shape of metaplasia	Change in area of involvement
	Chronic cervicitis					+	Vertical						
	Chronic cervicitis, erosive	+		+		+	Gradual						
	Erosion, polyp, leukoplakia			+			Oblique	3		3	+		
	Metaplasia			+	3	+			3			+	
	Metaplasia, polyp, cyst, chronic cervicitis	3		+		+		3	3			+	
	Metaplasia, leukoplakia cysts, acanthosis			+		+	Gradual						+
7	Metaplasia, erosion, hyperkeratosis, early metaplasia	+				+	Gradual	3				mild	
	Papillary	+		+			Gradual		3	3	+		
	Leukoplakia, bilateral lacerations, papillomas			+						3	+		+
	Metaplasia, chronic cervicitis, hyperkeratosis			+			Oblique				+	+	
	Metaplasia, lacerations, erosion, scar, hyperkeratosis, chronic cervicitis					+			3				
	Metaplasia, polyp			+							+	+	
	Metaplasia, erosion, chronic cervicitis			+		+						+	
	Metaplasia, erosion, scar, leukoplakia cyst			+		+		3	3			+	
	Metaplasia, lacerations			+						+	+		
	Total	5	5				F				6		

+ designates the condition indicated in parenthesis; mild, — moderate; marked.

stages of invasive or clinical carcinoma forms the basis of the study. The squamous epithelium of the portio vaginalis consists normally of two layers namely the stratum germinativum, several cells in thickness and the basal layer one cell in thickness. The cells of the stratum germinativum are rather large and polyhedral with round nuclei staining with a moderate intensity and with a considerable amount of cytoplasm. These cells are rather regularly spaced and appear to be in horizontal parallel rows. The more peripheral cells become somewhat flattened horizontally and appear larger and contain more cytoplasm. The cells of the basal layer are smaller than those of the stratum germinativum and contain a smaller amount of cytoplasm. The nuclei are small, round to oval stained deeply and the cells are placed parallel to one another more or less perpendicular to the cells of the stratum germinativum.

DISCUSSION OF CASES

The most characteristic finding of the squamous epithelium indicating departure from normal toward malignant transformation, was the presence of deeply stained (hyperchromatic) oval nuclei. This characteristic was always present and was diagnostic however it was found to exist to a varying degree. As a rule, the density of the nuclear stain was not as great in the earliest stages as exemplified by Case 1 (Fig. 1). Occasionally variations in the nuclear staining and size could be seen in the same cervix. For example, in Case 2 (Fig. 2) in one area the nuclei were deeply stained and large while in another area they were smaller and even darker stained. In Case 4 (Fig. 5) the nuclei appeared more or less uniformly oval and dark.

Decreased amount of cytoplasm in the epithelial cells was observed almost as often in frequency as the nuclear changes. This find-



Fig. 1. Case 1. This case reveals an extremely early carcinoma of the cervix with abrupt demarcations from the normal epithelium on each side of the lesion $\times 65$.

ing was more pronounced in the advanced cases. In Case 1 (Fig. 1) the cytoplasm was mildly decreased in amount and was more marked in the cells nearest the basal layer. All the other cases revealed a marked decrease of cytoplasm in the epithelial cells.

Another important characteristic was the development of a nondistinguishable basal layer. This layer seemed to replace the upper layers so that all the cells appeared similar to the basal cells. Of the 15 cases presented 12 cases disclosed this characteristic. The contrast between the basal layer of early carcinoma and normal epithelium can be seen in Case 3 (Fig. 4). In this microscopic section the normal epithelium had a single-cell basal layer; in the carcinomatous zone there was an abrupt change and the basal layer was not distinguishable from the cells above. This characteristic was also present in the areas of metaplasia disclosing changes of early carcinoma. In Case 5 (Fig. 7) the squamous epithelial cells of the entire gland appeared similar and the basal layer was not distinguishable. This change was outstanding in this case as revealed by a comparison with the changes of metaplasia without the characteristics of early carcinoma. In Case 6 (Fig. 8) leucoplakia was

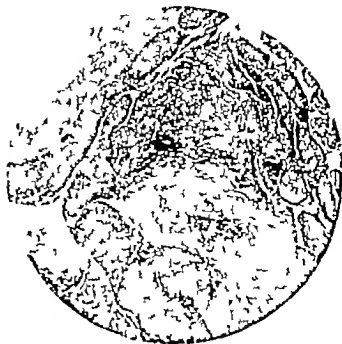


Fig. 2. Case 2. This case discloses several stages of early carcinoma in the same cervix, especially observed in the epithelium in the upper right. Epithelium of lower left is relatively normal $\times 65$.

present in the area associated with early carcinoma. Where leucoplakia was present alone, the basal layer was well defined and several cells in thickness. In the areas of early carcinoma in this section the basal layer appeared indistinguishable from cells above it.



Fig. 3. Case 2. High power photomicrograph of the same case as Figure 2. Basal layer is indistinguishable in the areas of early carcinoma. $\times 395$.



Fig. 4. Case 3. This case reveals the abrupt oblique line of transition between the early carcinoma and the normal epithelium (lower left of upper strip of epithelium). Other areas of this same cervix reveal invasive carcinoma. $\times 65$.

Mitoses were found occasionally in 10 cases and to a marked degree in 4 cases. In Cases 4 (Fig 6) and 6 (Fig 8) may be seen numerous mitotic figures.

The presence of an intact basement membrane was also an important characteristic of early carcinoma and was diagnostic of the pre-invasive stage. In the 6 cases which also contained invasive carcinoma, the basement membrane was penetrated in the areas of invasive carcinoma, even though it was intact in the areas of early carcinoma in the same cervix. In the 9 cases of early carcinoma alone, the basement membrane was intact. Case 8 (no illustration) revealed both conditions in different areas. An intact basement membrane was also seen in the areas of metaplasia associated with early carcinoma as disclosed in Case 5 (Fig 7).

The line of demarcation between the carcinomatous and the normal epithelium was searched for and was identified in 7 of the 13 cases. In 3 of these the demarcation was sharp and in 4 it was gradual. Case 1 (Fig 1) disclosed a demarcation on both sides of the area involved. In Case 3 (Fig 4) the demarcation was very definite and was an oblique

line. In Case 2 (Fig 2) the transition from normal epithelium to carcinomatous epithelium was gradual. At the upper part of the photomicrograph the cells of the epithelium appeared normal then there was an increase in thickness of the cells of the basal layer. The photomicrographs for Case 7 (no illustration) and Case 8 (no illustration) also revealed gradual transitions.

The stroma underlying the carcinomatous epithelium revealed lymphocytic infiltration in all of the cases presented. This infiltration varied in degree not only in each case but occasionally in different areas of the same case. It appeared that in this series of cases, there was no correlation between the amount of lymphocytic infiltration and the severity of the lesion.

All of the 13 cases also disclosed an increase in the number of cells of the stratum germinativum and of the epithelium as a whole. In the 6 cases of invasive carcinoma, 3 showed a moderate increase and 3 showed a marked increase. In the noninvasive cases, 6 showed a moderate increase, 2 a marked increase and 1 a mild increase. The correlation between the severity of the lesion and the increase of cells was not very definite in this group.

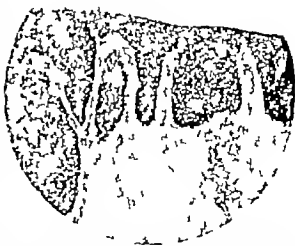


Fig. 5. Case 4. This case discloses the cells described as characteristic of early carcinoma in the still intact epithelium, undistinguishable basal layer and intact basement membrane. No invasion. $\times 100$.

All of the cases also revealed a loss of polarity of the cells. In 4 cases this feature was mild and in 9 cases it was marked. In all of the cases which had invasive carcinoma in other areas of the same cervix, the loss of polarity was marked.

All of the changes previously described were sometimes found in the squamous epithelium which replaced cervical glands as a metaplastic process. Usually the surface epithelium overlying these areas revealed the same changes. Ten cases of metaplasia with changes of early carcinoma in the epithelium of the same cervix were found in the material studied. Three of these cases revealed very little or no carcinomatous changes in the areas of metaplasias. Seven cases (Cases 4, 5, 10, 12, 13, 14, and 15) revealed that the glands with metaplasia were all involved in the changes of early carcinoma. All of these cases showed that the overlying epithelium was also involved in a similar change except in Case 13 where the epithelium was absent due to ulceration. In none of the 7 cases was there an invasion of the basement membrane by the malignant cells in the area of metaplasia. However, 3 of the 7 cases had invasive carcinoma in another area of the same cervix involving the surface squamous epithelium. No



Fig. 7. Case 5. The case discloses metaplasia combined with the morphological changes of carcinoma in the epithelial cells of the metaplastic areas. In the surface epithelium there were also changes of early carcinoma. $\times 100$.

attempt was made to relate metaplasia to development of squamous cell carcinoma of the cervix. The finding of metaplasia may have been only coincidental. However, in 8 cases it participated in the early changes of carcinoma in a manner similar to the participation of the surface squamous epithelium.

There were 2 cases of leucoplakia existing together with the morphological changes of early carcinoma in the squamous epithelial cells. In 1 case the basement membrane was intact throughout the cervix and in the other the basement membrane was invaded in areas. Case 9 showed the invasive carcinoma together with leucoplakia. In this case the areas of early carcinoma with an intact basement membrane in the same cervix revealed the squamous epithelial cells were characteristic of early carcinoma. Case 6 disclosed leucoplakia together with early carcinoma with an intact basement membrane throughout the entire cervix.

Cases 10 and 15 were studied in which only the changes of early carcinoma were seen in several original microscopic sections of the cervix. However, because of the suspicious character of the lesions, further investigation of these cervixes by means of additional sec-

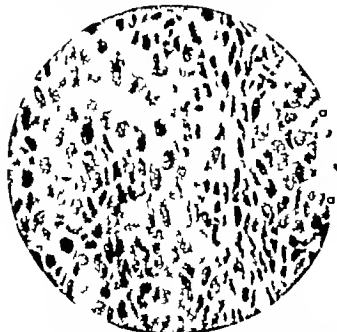


Fig. 6. Case 4. High power photomicrograph of same case as Fig. 5. The undistinguishable basal layer is present at a (Right). $\times 395$.



Fig. 8. Case 6. This case reveals leukoplakia combined with the morphological changes of early carcinoma. Hyperkeratosis and parakeratosis can be seen together. (1) by peritrophy of stratum germinativum. Increased irregularity of size and staining of cells. (2) stratum germinativum mitotic figures, increase of basal layer cells. (3) indistinguishable basal layer are also seen. $\times 100$.

tions from various areas was made and in Case 10 invasive carcinoma was discovered. This would not have been suspected by the appearance of the cervix from clinical or gross pathological studies and indicates the value of biopsy in the abnormal cervix. In Case 10 the cervix was removed with the uterus with the clinical diagnosis of chronic cervicitis with erosion. In Case 15 the first biopsy revealed evidence suspicious of early carcinoma and the cervix was subsequently removed for further investigation and study.

COMMENT

A series of 15 cases of early carcinoma of the cervix uteri as reviewed. 9 of these disclosed no invasive carcinoma elsewhere in the cervix and 6 revealed early invasive carcinoma in the same cervix.

The criteria of early noninvasive carcinoma were interpreted as possessing the following characteristics: (1) The squamous epithelial cells had a decreased amount of cytoplasm with deeply stained, oval nuclei. These changes were found in all of the 15 cases. (2) All cells of the epithelium resembled each other

closely from the basal to the uppermost layer so that the basal layer was not distinguishable. This change was observed in 12 cases. (3) In all cases, there was an increase in the number of cells of the stratum germinativum. (4) In 14 cases mitotic figures were present. (5) The basement membrane was not penetrated in any of the noninvasive cases. (6) The subepithelial tissue in all cases was infiltrated with lymphocytes. (7) Seven of the cases disclosed a line of demarcation between normal and carcinomatous epithelium. In 3 of these the transition was gradual and in the others, the demarcation was abrupt and distinct. (8) All 15 cases showed a loss of polarity of the cells. (9) The changes of early carcinoma were also found in areas of coexistent metaplasia in 8 cases. Usually the epithelium overlying these areas was involved in the same process. (10) In 9 cases leukoplakia existed in conjunction with the changes of early carcinoma in the surface epithelium. In 1 of these 2 cases invasive carcinoma was disclosed in some areas.

Two cases were seen in which the diagnosis of early noninvasive squamous cell carcinoma of the cervix uteri was made, which upon further study because of this diagnosis, disclosed early invasive carcinoma. These examples indicate the value of biopsy and also the value of further investigation of the cervix uteri in cases in which early noninvasive carcinoma has been diagnosed.

As a result of this study the earlier work of Rubin, Meyer, Schiller, Broders, and others is confirmed namely that cellular changes develop in the surface stratified squamous epithelium of the portio vaginalis of the cervix which are regarded as the early manifestations of malignant transformation. That these changes occur before there is invasion and before there is clinical evidence of carcinoma is also demonstrated. The report also indicates that the epithelial cellular changes are similar in noninvasive and early invasive carcinomas in areas not yet frankly or clinically carcinomatous, and closely resemble the changes found in the epithelial cells of frankly or clinically carcinomatous lesions. This tends to support the thesis that the so called intraepithelial preinvasive changes as described are the early

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iest signs and the forerunner of carcinoma of the cervix uteri

SUMMARY

A series of 15 cases of early carcinoma of the cervix uteri is presented. These cases reveal changes in the surface squamous epithelial cells which have been interpreted as the early cellular transformations of malignancy in the preclinical preinvasive stage of carcinoma. The changes stand comparison with previous

ly described early invasive squamous cell carcinomas of the cervix and are similar to the changes which are found in clinical frankly invasive squamous cell carcinomas of the cervix uteri. These changes have been described in detail.

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ACUTE INJURIES TO THE NECK INVOLVING THE FOOD AND AIR PASSAGES

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INJURIES involving the soft tissues in the neck vary in extent and significance from the trivial, superficial and inconsequential to the most extensive deep disabling life endangering and fatal. The proximity of important structures concerned with the vital functions confined to a small part of the body may account for the small number of patients with severe or serious injuries since it is likely that many die soon after wounding from exsanguination strangulation or aspiration of blood into the tracheal tree. Those who survive the immediate injury are threatened with mediastinitis due to leakage of nonsterile secretions into the retropharyngeal space. This complication is often the cause of death in fatal cases.

Injuries to the soft tissues of the neck in civilian practice occur only occasionally. Stab or gunshot wounds, penetration of glass fragments, and surgical accidents with injury to the trachea, pharynx, or other structures account for some, while injuries due to the swallowing of pins, needles, fish bones, tooth picks, and partial plates account for others.

This report concerns a group of patients who sustained injuries to the food and air passages in the neck, admitted to an evacuation hospital during the Italian campaign. Injuries involving the large vessels of the neck have been reported previously (1). The details of management in this series are presented with the hope that similar reports may help to establish the principles of immediate management of injuries to this part of the body.

CASE 1. Pfc. W., aged 42 years, was injured in a mine explosion at 10:00 p.m. October 17, 1944 and was admitted to the hospital on October 18 at 4:00 p.m. He sustained a penetrating wound of the chin near the midline between the hyoid bone and mental process with lodgment of the missile in the body of the 3rd cervical vertebrae. The missile traversed the pharynx leaving entrance and exit wounds which

opened into the fascial spaces of the neck. An x-ray examination disclosed air in the retropharyngeal space. At 10:00 p.m. October 18, under nitrous oxide-oxygen-ether anesthesia administered by the endotracheal method an incision was made along the anterior border of the upper $\frac{3}{4}$ of the left sternomastoid muscle. Fascial spaces of the neck were exposed and the foreign body was removed from the 3rd cervical vertebra. The contaminating secretions of the pharynx were sponged from the wound and the wound was left open. The posterior wound in the pharynx was exposed but not sutured. Food and water were administered by means of a tube passed through the nose into the stomach from October 18th to 28th. The wound was closed by positioning the head without suture on October 25 and was healed on November 6 at which time he was evacuated to a base hospital for further observation (Fig. 3). Penicillin was given in 25,000 unit doses every 3 hours intramuscularly for 7 days. The entire course was free from complications during the 19 day stay in the hospital.

CASE 2. Sgt. Santos, aged 24 years, was wounded by a sniper's bullet at 3:00 a.m. January 9, 1945 and was admitted to the hospital at 4:15 p.m. of the same day. The missile perforated the upper lip on the left side, entered the mouth, perforated the tongue, traversed the pharynx, and lodged between the 2nd and 3rd cervical vertebrae. In addition he sustained injuries to the buttocks and extremities. An x-ray examination showed air in the soft tissues of the neck down to the mediastinum. At 9:00 p.m. under nitrous oxide-oxygen-ether anesthesia administered through an endotracheal tube the fascial spaces of the neck were exposed through an incision along the anterior border of the left sternomastoid muscle. The foreign body was removed and the defect in the posterior wall of the pharynx was demonstrated but not closed. The wound was left open without drains. The wounds of the lip and tongue were debrided and sutured. Feedings were administered for 8 days by means of a tube passed through the nose. Following this he was fed by mouth without difficulty or complaint. By positioning the head and by proper bandaging the wound was closed without suture. The patient was evacuated to a base hospital on January 20. Penicillin was given in 25,000 unit doses every 3 hours intramuscularly. The postoperative course was free from complications and no evidence of infection was noted at any time.

CASE 3. Pfc. L. was wounded by shrapnel at 5:30 p.m. March 2 and he arrived at the hospital 5 hours later. He sustained a penetrating wound of the right carotid triangle with lodgment of a foreign body in

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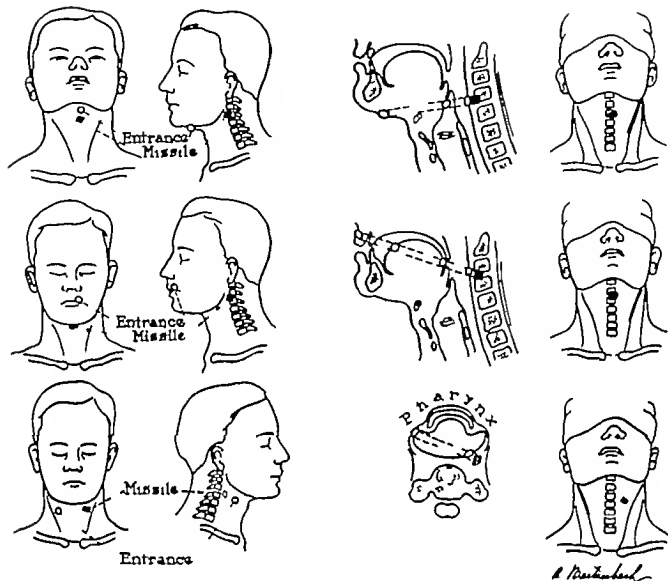


Fig. 1. Sites of entrance and lodgment of foreign bodies, path of gross tissue damage and location of surgical approach, Cases 1, top, 2, middle, and 3, bottom.

the prevertebral space to the left of the midline at the level of the 4th cervical vertebrae. There were two wounds in the pharynx—a right lateral and posterior. Under nitrous oxide-oxygen-ether anesthesia administered through an endotracheal tube the retropharyngeal space was exposed through an incision over the right sternomastoid muscle. The foreign body was removed. No closure of the openings in the pharynx was attempted. He was fed for 8 days through a tube passed through the nose. After this he was able to take liquids by mouth. He was given 25,000 units of penicillin every 3 hours intramuscularly. Patient was evacuated to a base hospital on March 14 with the skin wound not yet healed but ready for closure.

These patients (Cases 1, 2 and 3) sustained injuries to the pharynx with leakage of air and pharyngeal secretions into the exposed spaces

in the neck. In the first, the missile lodged in the vertebral body; in the second the missile lodged in the intervertebral cartilage, while in the third the missile was free in the retropharyngeal space. In all x-ray examinations disclosed free air in the retropharyngeal space—dissecting down toward the mediastinum (Fig. 2). The danger of infection in the spaces of the neck is well known. Decompression of these spaces by incising the fascial wall for the prevention of infection or treatment of established infection is well known and has been successful in the past. The use of penicillin was routine in each case. The freedom from infection in the presence of pharyngeal secretions in the retropharyngeal space would sug-



Fig. 2. Reproductions of lateral views showing air in the retropharyngeal space (Cases 1, 2, and 3).

gest on the basis of experiences in the past that penicillin was a factor in preserving a clean wound in the postoperative period.

CASE 4. P. T. H. sustained a large irregular wound on the right side of the neck between the mastoid process and the angle of the jaw from a mortar shell fragment at 5:00 p.m. January 10 and was admitted to the hospital at 10:30 a.m. of the following day. H. had considerable difficulty in breathing and swallowing. There was a marked bulge in the posterior pharyngeal wall almost occluding the larynx and the mucous membrane was hemorrhagic and swollen. On x-ray examination a large foreign body was disclosed lying anterior to the 1st and 2nd cervical vertebrae projecting beyond the midline (Fig. 5).

A tracheotomy was done under local anesthesia at 12:00 noon and after stabilization of his general condition ether anesthesia was induced through the tracheotomy tube at 5:00 p.m. Provisional control of blood flow in the right carotid artery was provided through an incision along the anterior border of the right sternomastoid muscle. The retropharyngeal

space was exposed and the large foreign body (3 cm. long \times 5 cm. wide \times 1 cm. thick) was withdrawn through the wound of entrance. It was found that no large vessels were injured and the pharynx was not perforated. The wound was cleansed well, damaged tissue was removed and small bleeding vessels were ligated. All wounds were left open. Sulfadiazine in 5 gram doses was given intravenously for 2 days and by mouth for an additional 3 days. The tracheal tube was removed on the 3rd day. Progress was satisfactory and the patient was evacuated to a base hospital on January 18 in good condition.

The large size of the foreign body, the site of penetration and lodgment in the neck, and the small extent of damage found at operation attest to the rôle chance plays in the life of the wounded soldier. The retropharyngeal space was contaminated by the foreign body, but no evidence of infection was ever disclosed.



Fig. 3. Case 3. Method of wound closure effected without suture.

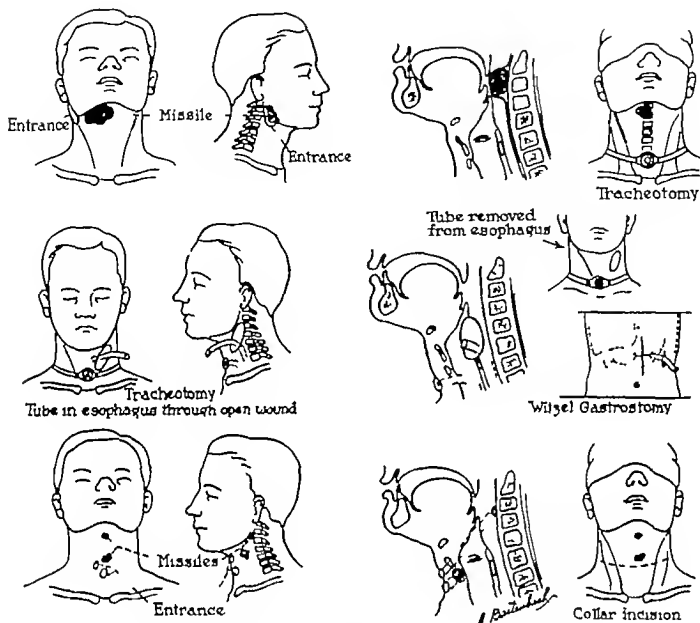


Fig. 4. Sites of injury in Cases 4, top, 5 middle, and 6 bottom, and methods of treatment.

CASE 5. Pvt. R. aged 25 years sustained a shell fragment wound of the neck on October 26 1943 at 12:45 p.m. and was admitted to an evacuation hospital on the same day. While here a tracheotomy was done because of laryngeal injury and a catheter was passed into the esophagus through the debrided external wound on the left side of the neck. He was transferred to another hospital on November 5. His general condition was poor. He had repeated hemorrhages from the neck wound and bled profusely from the mouth. Repeated blood transfusions were given to restore his blood volume. The catheter in the external wound was removed and a tube for feeding was passed through the nose. This decreased the frequency of the hemorrhages but bleeding was still a daily occurrence. On November 12 a Witzel type gastrostomy was done under local anesthesia for

feeding and the intranasal tube was removed. He had no further hemorrhages bleeding ceased from the wound and his general condition improved markedly. He was transferred to a base hospital on November 16 1944 where he continued to improve. He was then evacuated to the Zone of the Interior.

This patient sustained a severe injury in which hemorrhage and infection were the immediate dangers. The cessation of bleeding with removal of the feeding tube passed through the pharynx suggests that pressure and irritation provoked bleeding from granulating surfaces or injured pharyngeal vessels rather than an injury to a large artery or vein.



Fig. 5. Case 4. Note size of foreign body especially its penetration beyond the midline.

The simple gastrostomy an important measure in this case, provided a means for administering an adequate diet and fluids without disturbing the patient with intravenous or nasal tube feeding. The procedure is valuable and should not be relegated to the position of a final resort in a "hopeless" situation.

CASE 6. Pvt. B, aged 21 years, sustained shell fragment wounds of the neck, chest, and left forearm at 9:00 a.m. January 11 and was admitted to the hospital at 11:30 p.m. of the same day. He coughed frequently with bloody expectoration. There were 2 entrance wounds on the anterior aspect of the neck, little swelling of the neck but pain on pressure over the trachea. A ray examination disclosed 2 foreign bodies in the midline—one anterior to the cartilage between the 2nd and 3rd cervical vertebrae and the other at the level of the 4th cervical vertebra in contact with the larynx.

Under nitrous oxide-oxygen-ether anesthesia, the wounds were exposed through a collar incision. Damaged laryngeal cartilage was removed and the retropharyngeal space was exposed. One large foreign body with cloth attached was removed.

The patient was fed through a tube for 3 days after which he took liquids by mouth. There was no wound drainage. Sulfadiazine was given in 2½ gram doses intravenously twice daily for 3 days.

He was evacuated to a base hospital on January 17 where wound healing continued satisfactorily.

In other case reports in this series and in another series of vascular injuries of the neck an incision along the anterior border of the

sternomastoid muscle was used most frequently. In this case a collar incision served to expose the wound tracts and involved spaces. Incisions are made for a purpose and neither the collar incision nor the oblique incision can be regarded as routine practice. In each case a survey is made of the sites of injury structures that must be exposed and the structures that must be available in the wound if one is to prevent needless loss of blood and tissue damage. Collar incisions are preferable but their use is secondary to the requirements of the case. In this instance one small foreign body was not removed but no follow up examination was possible and the effect of this requires further investigation.

CASE 7. Pvt. K., aged 19 years, sustained shell fragment wounds of the neck, right shoulder, left forearm, and right leg some time before noon June 28, 1944 when he was given first aid and sent to a field hospital at 1:05 p.m. Here because of dyspnea and cyanosis a tracheotomy was done and the patient was evacuated to the hospital at 4:15 p.m. of the same day. On examination the neck presented two large defects with extensive loss of tissue. The entrance wound was about 1 inch in diameter to the left of the midline above the clavicle—the exit wound was 3 inches in diameter on the right side of the neck below the chin. All the intervening tissues had been "blown out." The entire larynx and ⅔ of the cricoid cartilage were absent and the anterior and lateral walls of the pharynx were missing. Below the hyoid bone there was a large cavity leading in

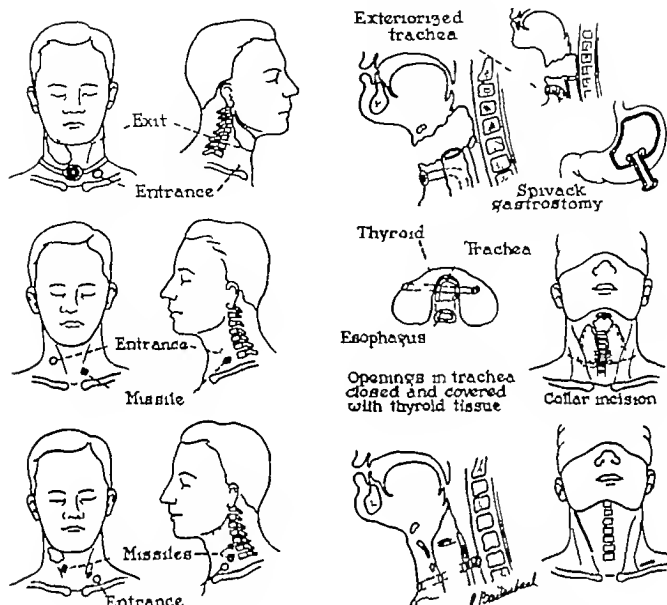


Fig. 6 Location of injuries in Cases 7, top, 8, middle, and 9, bottom and method of management

feriorly into the trachea and the esophagus. A large portion of the left sternomastoid muscle was missing. The right common carotid artery was exposed in the field. Smaller vessels were thrombosed and the wound was free from hemorrhage. In addition he sustained compound fractures of the left clavicle, right ulna and right tibia. There was an extensive accumulation of nasopharyngeal secretions which were controlled with atropine and mechanical suction. With oxygen therapy and 1,000 cubic centimeters of whole blood his condition improved. Under ether anesthesia administered through the tracheotomy tube the wounds were cleansed, damaged tissues excised and splints applied to the extremities. His general condition was not good. He could not tolerate a feeding tube and was maintained on intravenous proteins, salts, dextrose and vitaminus. On July 2 a tubovalvular type gastrostomy was done. He was fed through this and gained considerably in

weight and strength. Because of repeated bouts of aspiration pneumonia, the tracheal orifice was exteriorized. A narrow zone of pharyngeal mucous membrane 1 centimeter wide extended from the nasopharynx to the esophagus. By July 20 he was up and about able to feed himself through the new gastric stoma. He was evacuated on July 24 to a base hospital where the neck wound healed.

This patient sustained a severe injury with extensive loss of substance to the air and food passages of the neck. The gastrostomy in this case was of a type which did not require the presence of a catheter for patency. The valvular effect prevented leakage following filling of the stomach. Exteriorization of the trachea prevented aspiration of nasopharyngeal se-



Fig. 7. Case 7. Loss of larynx, cricoid cartilage and tensor, all of pharynx following passage of missile through the neck. a, On admission with tracheotomy tube. b and c, Bowing externalization of trachea.



Fig. 8. Case 9. Emphysema of soft tissues following tracheal injury.

cretions. A narrow strip of posterior pharyngeal wall suggested the possibility of reconstruction of the pharynx by a plastic procedure. However the large cutaneous defect precluded such a procedure at this time.

CASE 8. Sgt. F., aged 24 years, sustained a shell fragment wound of the neck at 3:00 p.m. on May 12, 1945 and arrived at a clearing station at 5:00 p.m. where one unit of plasma was administered. He was evacuated and arrived at the hospital at 7:00 p.m. of the same day. He was dyspneic and coughed with a bloody expectoration. The neck was swollen and emphysematous. A small wound was noted to the

right of the midline below the level of the cricoid. An x-ray examination disclosed a metallic foreign body to the left of the midline anterior to the 7th cervical vertebra with considerable air in the soft tissues of the neck (Fig. 7). Under nitrous oxide-oxygen-ether anesthesia administered through an endotracheal tube after cannulization of the larynx, a transverse incision was made exposing the tract of the wound. The trachea was perforated. The missile traversed the thyroid gland at the isthmus, passed into and out of the lumen of the trachea, and lodged in the soft tissues to the left of the midline. The damaged thyroid tissue was excised and bleeding vessels were ligated. The openings in the trachea were trimmed, sutured loosely and covered with ad-

adjacent thyroid tissue without tension. The foreign body was removed and the collar incision left open. The patient made satisfactory progress. There was no drainage from the wound and when the patient was evacuated to the base hospital on May 20 the wound was well closed without suture.

This patient illustrated a phenomenon noted in other patients with injuries to the neck. Dyspnea of mild or severe degree is noted frequently especially in vascular injuries but also in any case in which swelling of the neck involving the deep structures develops acutely. It has been found that breathing in the postoperative period is free from difficulty when the fascial spaces are exposed by incision of the tense fascial sheaths.

CASE 9. Sgt W. aged 25 years sustained penetrating grenade fragment wounds of the neck early on June 4, 1944, and was admitted to the hospital at 7:00 p.m. of that day. There was a loss of skin resulting in an irregular defect 4 by 2 centimeters in size at the junction between the chin and the neck on the right side and an irregularly shaped wound 1 centimeter in diameter posterior to the left sternomastoid muscle above the clavicle. The neck was swollen with air in the soft tissues. A cough was associated with a bloody expectoration. An x-ray examination disclosed a foreign body at the level of the anterior surface of the 6th cervical vertebra to the right of the midline and another in the left supraclavicular fossa (Fig. 8). The larynx was swollen and hemorrhagic, the air passage reduced about 50 per cent in size.

Under nitrous oxide-oxygen-ether anesthesia administered through an endotracheal tube, the wounds in the neck were freed from damaged tissue and the foreign bodies were removed. An exploration of the large vessels, larynx, and trachea was made through an incision along the anterior border of the right sternomastoid muscle and also a supraclavicular incision on the left side. Aside from some small bleeding vessels, only the larynx sustained a perforating wound. The edges of the entrance and exit were excised and the wounds were closed with adjacent tissues. The surgical wounds were sutured. The endotracheal tube was left in place for 1 hour in the postoperative period. Breathing subsequently was unimpaired and the patient progressed satisfactorily. He was evacuated to the base hospital on June 8 in good condition.

In the patients who sustained acute injuries to the respiratory passages immediate closure of the perforation was done at the time initial surgery was undertaken. It is noteworthy that dyspnea frequently present on admission to the hospital was no longer present in the immediate postoperative period and did not

recur. Exposure of the fascial spaces in the neck appeared to be the factor responsible for this freedom from dyspnea.

SUMMARY

1 Injuries to the air and food passages in the neck are not common in patients admitted to an evacuation hospital.

2 Tracheotomy may be necessary and urgently so when signs of obstruction are noted. However in many instances of neck wounds with dyspnea—incision into the fascial spaces as part of the initial surgery of the wound was followed by relief from the signs and symptoms of obstruction.

3 Anesthesia may be administered through the tracheotomy tube or through an endotracheal tube. Aspiration of the trachea and bronchi may be accomplished easily. This is an important factor in the avoidance of pulmonary complications. For wounds of small magnitude local anesthesia is useful.

4 When contamination of the deep neck structures has occurred because of perforation of the oral pharyngeal or esophageal mucous membrane incision into the fascial layers with exposure of the retropharyngeal space prevents edema and spread of infection into the mediastinum.

5 The value of gastrostomy in certain wounds of the pharynx and esophagus should be appreciated and the operation done while the patient is in good condition when tube feeding through the nose is not possible.

6 Tracheal wounds when not too extensive tend to close or may be closed by suture of the overlying fascia muscle, or adjacent thyroid tissue.

7 The skin wounds adjacent to openings in the food and air passages are left open until it is certain the wound is free from gross infection. Closure of the wounds may be done after 5 days by suture or by positioning of the head and purposeful bandaging.

8 Penicillin is used routinely and appears to be a factor in the avoidance of local and spreading infection.

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THE TREATMENT OF PANCREATIC PAIN BY SPLANCHNIC NERVE SECTION

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OF the many causes of abdominal pain the one caused by affections of the pancreas is one of the most severe and most intractable. One can readily distinguish two components. The first is visceral, due to the direct or transmitted stimulation of the celiac ganglion accompanied by girdle pain around the waistline and radiating fanwise to the lower abdomen. This pain is continuous, but shows intermittent lancinating exacerbations not unlike that of a tabetic crisis. Carcinoma of the body of the pancreas, acute pancreatic edema and chronic sclerosing or calcareous pancreatitis all may exhibit such symptoms.

When the lesion extends to the peritoneum the somatic sensory fibers of the lower intercostal or upper lumbar nerves or even the branches of the lumbosacral plexus are irritated. This somatic pain shows skin hyperesthesia in the appropriate segments and sensitivity of the spinous processes of the segmental zones. Muscle rigidity may appear.

Paravertebral block of the corresponding segments extending in the case of the pancreas from the sixth to the tenth dorsal level abolishes visceral pain but only so much of the somatic pain which happens to travel through that area. Mandl in his pioneer monograph on paravertebral injections gave many examples of relieving colics originating in gastroduodenal, gall bladder, renal or other visceral lesions. No mention was made, however, of pancreatic pain. One of us (G. deT.) in a monograph on local anesthesia, advocated the use of diagnostic paravertebral injections for the differentiation of upper abdominal pain.

Intractable pain from the gastrointestinal tract or from the biliary passages has been relieved by paravertebral block with alcohol or by splanchnic nerve section and such in-

stances are on record from the case reports of White and Smithwick who also summarized the previous literature. Craig in 1934, relieved chronic biliary pain by his infradiaphragmatic splanchnicectomy. The pain of gastroduodenal ulceration has been reported to have been relieved by a number of authors even though the aggravation of the ulcer has been suggested by the creation of a relative vagotonia. In the case of Weeks and associates (4b) a painless duodenal perforation occurred in the sympathectomized patient.

The French literature contains an extensive study on the effect of splanchnicectomy in chronic pancreatitis. Mallet-Guy and his co-workers reported 11 such cases in which unilateral splanchnic nerve section was done. Of these, all had immediate relief after unilateral (left) splanchnic section but 1 patient showed a recurrence of pain after 5 months, another had only a short follow-up and could not be re-examined. 9 patients had complete relief lasting as long as 2 to 3 years. These patients had all been subjected to exploratory laparotomy and biliary drainage had been unsuccessful in relieving their symptoms. The left splanchnic nerve was sectioned in 10 of the 11 cases below the diaphragm, often with difficulty because of the inflammatory reaction in the retroperitoneal tissues. In 1 case the right splanchnic nerve was cut.

From the same institution Marion reported the treatment with splanchnic anesthesia of 7 patients with acute pancreatitis thus promptly relieving the pain and postponing immediate laparotomy.

In a recent article written by pupils of Leriche (3) 1 case was reported in which splanchnic resection was undertaken for chronic pancreatitis. One case of this sort was also mentioned by Smithwick in a discussion of Whipple's paper on radical surgery for certain cases of calcareous pancreatitis, but to our knowledge it is yet unpublished.

From the Department of Surgery, University of Illinois College of Medicine and the Research and Educational Hospitals. Paper read at the Chicago Surgical Society May 2, 1947.

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We wish to report 2 cases in which unilateral splanchnicectomy was performed for intrac table pancreatic pain.

CASE 1: C.H. Hospital No 108768. A 49 year old white male was admitted to the Research and Educational Hospital on December 10 1946 with complaints of pain in the epigastrium radiating posteriorly to the back which had been present for 3 months prior to admission. There had been vomiting shortly after meals for the 10 days prior to admission shortness of breath and constipation of 3 months duration. The pain was described as constant and dull aching starting in the midepigastrium just to the right of the midline and radiating posteriorly to the back in the midline around the level of the lower dorsal vertebrae. There was a weight loss of 15 pounds in 3 months and a marked anorexia. There was no history of clay colored stools or dark urine.

Physical examination revealed a patient of emaciated appearance and chronically ill in appearance. Temperature was 97.0 degrees, pulse 70, respirations 15 and weight was 138 pounds. The heart was normal. There were a few expiratory wheezing rales in the right upper lobe. The abdomen was flat but there was a sense of fullness in the epigastrium although no definite mass was palpated. The upper abdomen in the midepigastrium was moderately tender as were the left hypochondrium and left lumbar areas. Rectal examination was negative. The red blood cell count was 3,730,000 white blood count 9,800. Serum amylase was 146 on December 21 1946 612 on December 30 1946 and 61 on January 11 1947. Total proteins were 7.5 per cent with a serum albumin of 5.5 per cent and a serum globulin of 2.0 per cent. Fasting glucose was 143 milligrams, nonprotein nitrogen 38 and chlorides 511 milligrams per 100 cubic centimeters. An upper gastrointestinal roentgenogram and barium enema were reported as normal. Roentgenogram of the chest revealed a circular density to the left upper lobe considered to be a metastatic lesion. Roentgenogram of the dorsal spine was negative. After adequate preparation for surgery which consisted in part of multiple blood transfusions the patient was operated upon on January 2 1947 by Dr. Warren H. Cole. When the peritoneum was opened a large tumor mass occupying the posterior portion of the pancreas and extending upward to the liver edge was seen. The tumor was estimated to measure 3 by 3 by 5 inches. There were no metastases to the liver although the superior extension of the tumor consisted chiefly of metastatic nodes. In spite of the probable metastasis to the lung resection appeared indicated in view of the patient's extreme pain. However closer inspection of the tumor revealed a superior portion of the mass with its metastatic nodes to completely surround the celiac axis. The hepatic artery could be felt coming out of the center of the mass. This one point in addition to the complete incurability caused the decision against resection to be made so the abdomen was closed.

In the postoperative period this patient's pain continued and required large doses of narcotics and sedation for effective relief. However even heavy doses of narcotics failed to give him adequate relief. For these reasons consideration was given to the possibility of splanchnic nerve block and perhaps resection of the nerve if indicated by a favorable response to the block. On January 10 1947 a right paravertebral sympathetic block was done from sixth to the tenth dorsal injecting 10 cubic centimeters of 1 per cent novocain at each level. Twenty minutes after the block the patient stated that the epigastric pain had completely disappeared. For 12 hours after the block there was no return of pain. The patient had not received sedation or narcotics for 8 hours preceding the block.

On January 14 1947 under intratracheal anesthesia, Dr. Geza deTakats performed a resection of the right splanchnic nerve from the level of the diaphragm to seventh dorsal. The sympathetic chain was also excised from above ninth dorsal to below the twelfth dorsal. A small tear was made in the pleura during this dissection which was closed with interrupted cotton sutures.

Convalescence from this operation was uneventful and there was prompt relief from the epigastric pain. He was discharged from the hospital on January 23 1947 9 days after the splanchnicectomy. At the time of discharge he was eating well and had gained several pounds in weight. The relief of pain however lasted for only a period of 3 weeks postoperatively. Deep roentgen ray therapy to the pancreas was begun on January 31 1947 and shortly after this the epigastric pain returned. The pain became progressively more severe and again it was necessary to administer narcotics for effective relief. The patient refused rehospitalization and became progressively worse. Death occurred on March 4 1947. Permission for an autopsy was not obtained.

CASE 2: J.A.W. Hospital No 109477. A 22 year old white unmarried female was admitted to the Research and Educational Hospital on December 15 1946 with complaints of extreme constant aching pain in the epigastrium radiating to the left flank. She had been well until December 1945 when she first had noted a dull intermittent pain to the left lumbar area radiating in a radicular fashion to the left hypochondrium. These attacks of pain would occur several times daily and occasionally be associated with vomiting and extreme weakness. She had been hospitalized at another hospital 10 January 1946 and we were informed that a left heminephrectomy of the lower pole had been performed at this time because of a diagnosis of carbuncle of the kidney. The patient remained in the hospital for a period of 5 weeks. The pain persisted after surgery and 2 weeks following her discharge from the hospital she was readmitted remaining in the hospital until August 1946. During this period of hospitalization she had had daily chills with temperature elevations to 104 degrees. During the second hospital stay she noted a swelling in the epigastrium there



Fig. 1. Film of the abdomen showing number of calcareous deposits to the left of the spinal column: 1 the level of the first and second lumbar vertebrae. Case 2. Left splanchnic nerv. section and lower dorsal sympathectomy completely relieved the patient's intractable pain.

were intermittent episodes of vomiting, a progressive weakness and weight loss, and a relatively persistent pain in the epigastrium and left lumbar region. After a month of hospitalization the patient was again discharged. Symptoms persisted and in March the patient went on an alcoholic bout because of pain. Severe diarrhea developed after 1 week of drinking and this caused the patient to terminate her alcoholism. She was hospitalized for the third time and a gastrointestinal x-ray series at this time revealed a large mass present posterior to the stomach and displacing this organ anteriorly. This was interpreted as a large pancreatic cyst. The patient was reoperated upon through the old nephrectomy incision, but there were no reported abnormal findings. One week after the operation a roentgenographic study of the gastrointestinal tract revealed a dramatic reduction in size of the cystic mass. After healing of the lumbar incision the patient was discharged from the hospital and stated that she felt somewhat improved although periodic attacks of pain in the epigastrium and left flank continued to occur. For the 24 hours prior to admission to the Research and Educational Hospital the pain had become severe and there had been a voluntary dietary restriction but no vomiting.

On her first admission to this hospital the patient was acutely ill. The temperature was 102 degrees F, respirations 24, and blood pressure 110/60 millimeters of mercury. There was marked dehydration, emaciation and weakness. The heart and lungs were normal. Diaphragmatic excursions were normal. There was a marked distention of the upper abdomen, especially in the epigastrium and this portion of the abdomen was rigid. There was also some rigidity of the lower abdomen but only to a slight degree. The entire upper abdomen was acutely tender. The bowel sounds were active, but not increased. The liver and spleen were not palpable. There was moderate tenderness in the left flank posteriorly. There was no demonstrable fluid wave. Pelvic and rectal examinations were negative. The red blood cell count was 3,800,000 and the white cells were 28,000. The serum amylase was 42 units. On succeeding days the amylase levels were as follows: December 16, 1946, 23; December 21, 38; December 23, 138; December 27, 111; January 4, 947; 69; January 8, 40; January 11, 43; January 14, 50. The remainder of the blood chemistry on the day of admission was: total protein 6.9 per cent with 4.4 per cent serum albumin and 2.5 per cent serum globulin. Nonprotein nitrogen was 35 milligrams; glucose was 68 milligrams per 100 cubic centimeters of blood.

A flat plate of the abdomen revealed no free air beneath the diaphragm. There were irregular multiple calcareous densities to the left of the first lumbar vertebra interpreted as pancreatic calculi (Fig. 1). An intravenous pyelogram revealed no abnormalities.

A Levine tube was inserted into the stomach and continuous Wangenstein suction was instituted. Intravenous fluids were administered. Penicillin 50,000 units every 3 hours was begun. Under this conservative treatment there was some slight diminution of the pain during the first 24 hours, but the tenderness and epigastric distention persisted. The white blood count was 28,000 the day of admission and then gradually dropped until the fifth day when it was 4,300. On the third day there was some lessening of the abdominal distention and considerably less tenderness. A diagnosis of pancreatic lithiasis and pancreatitis with possible pancreatic cyst was made and following several blood transfusions and further hydration of the patient an exploratory laparotomy was performed by Dr. Warren H. Cole on December 31, 1946. When the peritoneal cavity was opened a large mass was found pushing the stomach anteriorly in the midline. The gall bladder was normal. The mass consisted of the pancreas, enlarged to three or four times its normal size, nodular and very firm. The fact that it displaced the stomach forward had resulted in an erroneous preoperative impression that it was a cyst. The entire pancreas was involved in the process although the tail was not quite so large. Further exploration of the abdomen was unrevealing, and the wound was closed in layers without drainage. The postoperative

course was uneventful. The pain, however continued and there was severe anorexia with irregular episodes of vomiting which usually occurred after the intake of even small quantities of food. Parenteral fluid therapy was necessary to maintain the patient's nutritional status at all. Parenteral high vitamin therapy and penicillin were continued and in addition a course of streptomycin (1 gram per day) was given for a 10 day period. Considerable sedation was necessary to control pain at all times. There was some slight improvement on the fourteenth day after surgery and at the patient's request she was discharged from the hospital with instructions to return to the out patient department in 1 week for observation. Readmission to the hospital occurred on January 20 1944. The patient stated that since leaving the hospital she had had almost continuous pain nausea vomiting and weight loss so that on admission she weighed only 78 pounds. Her problem remained the same—continuous narcotic administration was necessary to control pain amounting to 3 grains of pantopon a day.

Consideration of splanchnic nerve block or resection was suggested to attempt to relieve this pain and accordingly on January 30 1944 a dorsal sympathetic block was performed. Ten cubic centimeters of 1 per cent novocain were injected paravertebrally on the left side in each of the segments from the sixth to the tenth dorsal. The block was done in the afternoon and in the morning preceding the block no sedation or narcotics had been administered. Within 10 minutes after the paravertebral block the patient reported that there was complete relief of pain and for the first time in many weeks the patient was comfortable. She slept that night without sedation and felt rested. Because of this result resection of the left splanchnic nerve was deemed advisable. On February 4 1944 one of us (G deT.) performed a left splanchnic nerve resection including removal of the dorsal sympathetic chain between ninth and twelfth dorsals. This operation was performed under intratracheal anesthesia. The eleventh rib was resected. Reflection of the pleura revealed considerable inflammatory reaction in the posterior mediastinum. The patient tolerated the surgery very well and her postoperative course was uneventful. There was complete relief of the pain in the epigastrium. Abdominal distention disappeared. There was moderate pain over the thoracotomy incision for several days but no sedation was required after the second day. The patient was ambulatory on the second day began to eat a general diet and on discharge from the hospital on February 12 1944 she weighed 82½ pounds. The patient has remained symptom free up to the most recent follow up visit on March 20 1947 and has gained weight steadily. She weighed 107 pounds 2½ months after splanchnic section a gain of 29 pounds.¹

Pain relief in the first case was quite temporary. Because of the extensive spread of car-

Relief of pain persists on re-examination 6 months after operation.

cinoma in the peritoneal and retroperitoneal tissues, this was to be expected. However we were amazed to see the dramatic relief from pain and if confronted with a similar situation one might prefer an alcohol injection to the lower dorsal segments. The return of pain was not due to the presence of the opposite splanchnic nerve since it appeared on the right (operated) side.

In the second case the result so far (6 months at this writing) has been lasting. What struck us most was the sudden disappearance of the epigastric distention and one might speculate whether or not this is a direct effect on pancreatic edema and distention or an interruption of reflex pylorospasm. In this connection one must point to the fact that both cardio-spasm and pylorospasm produced experimentally by vagal section can be abolished by sympathectomy (5) and that pylorospasm in acute biliary and pancreatic episodes is a frequently recognized clinical entity.

The preoperative diagnostic injections of procaine to appropriate segments is advisable here as before any other form of sympathectomy. It is probable that bilateral splanchnic sections may become necessary if the pain should shift to the side not operated upon. However the operation may have a direct effect on the inflammatory process and on the vascularity of the gland thus supplying a direct therapeutic effect (9).

Since the splanchnic nerves are the sensory nerves of the upper abdominal viscera, the question of visceral pain following splanchnic section for hypertension naturally arises (4). Of 250 patients who have undergone splanchnic section done on our service, only a few observations have been made which are germane to this subject. One such patient has been closely studied at our hospital and hence her history is given in detail.

CASE 3. L.S. Hospital No 106791. A 38 year old married woman had a bilateral splanchnic nerve section done on April 30 1946 and on May 21 1946 for a progressive essential hypertension of 13 years duration starting with a pregnancy in 1932. Her average preoperative blood pressure was 213/110 millimeters of mercury and the preoperative work up indicated that she belonged to a group 1 hypertension with little organic damage. She left the hospital with a blood pressure varying from 150 to 126 systolic and 100 to 96 diastolic millimeters of mercury.

She was readmitted to the hospital a month later with itching of the skin, jaundice, dark urine, and a mass in the right upper quadrant of 8 weeks' duration. Eight weeks and 6 weeks before admission she had had episodes of nausea and vomiting following heavy meals. After these attacks jaundice and a lump in the abdomen appeared. There was no pain at any time, but the nausea persisted. On entrance the patient's blood pressure was 135/95 millimeters of mercury. She was manifestly icteric and the liver was palpable four fingers below the costal margin. Over the edge of the liver a tense, tender gall bladder was palpable. The lesion was so painless that prior to admission a diagnosis of homologous serum jaundice was made, since she had received two blood transfusions during each of the splanchnic nerve sections. Of the laboratory findings the urobilinogen and cephalin flocculation tests were negative, blood bilirubin was 15 on 15, icterus index was 66 and amylase 116 units.

On August 19, 1946 with a preoperative diagnosis of obstructive jaundice Dr. Warren H. Cole found a greatly thickened gall bladder containing stones. There were numerous adhesions between the gall bladder duodenum and colon. After they were separated a greatly thickened common duct was opened and at least twenty small stones and one large stone about 2.5 centimeters in diameter were removed. The large stone was found to be impacted in a cystic dilatation of the common duct and was wedged in so as to block the duct. The gall bladder was removed and a T tube was placed in the common duct. Convalescence was uneventful. The patient was discharged on the 15th postoperative day and the T tube was removed in 5 weeks.

The percentage of painless jaundice in impacted common duct stones and with a distended gall bladder is not too large, but still common enough not to allow a definite statement that the absence of colic here was due to splanchnic section. More important, however, is the fact elicited after careful questioning that this patient has had upper abdominal distress prior to splanchnic section for 11 years, with occasional bouts of severe pain prior to splanchnic section but never after. Since visceral afferent fibers of the upper abdomen are carried in the splanchnic nerves, the question of eliminating danger signals of threatening perforation may be raised. It must be emphasized that peritoneal irritation is mediated by somatic fibers and that sensation of nausea is known to be mediated through the vagus nerves.

SUMMARY

Two case reports are presented in which unilateral splanchnic nerve section with lower dorsal sympathectomy was done for intractable pain due to pancreatic disease. In the first case the patient was in a terminal phase of an inoperable carcinoma of the body of the pancreas and relief was of short duration. In the second case, that of a chronic recurrent calcareous pancreatitis with exacerbations, the operation resulted in sudden relief now lasting over 3 months in a patient whose pain could not be controlled with heavy doses of narcotics taken over a period of 15 months.

A third case was presented in which a bilateral splanchnic nerve section undertaken for the relief of hypertension was followed by a painless obstructive jaundice for which an impacted common duct stone was responsible.

The value of paravertebral block, followed if necessary by splanchnicectomy, is emphasized in intractable painful upper abdominal pain of visceral origin. This method has not received the attention it deserves.

Since this article was submitted for publication, other cases were studied. One patient had a chronic pancreatitis and the second persistent pain following cholecystectomy. Interruption of sympathetic pathways resulted in relief from intractable pain which now lasts for 2 and 3 months, respectively. In the case of Rlenhoff (*J. Am. Med. Ass.*, 94: 34-36) both splanchnics and both vagi were cut for the relief of pancreatic pain, but in our experience unilateral splanchnicectomy and ganglionectomy suffice.

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SURGICAL TREATMENT OF IRREDUCIBLE INTUSSUSCEPTION IN INFANTS

J PEYTON BARNES M D F.A.C.S Houston Texas

THE treatment of an intussusception found to be irreducible at operation is the subject of this discussion. The etiology, diagnosis, preoperative and postoperative treatment will not be considered except details which are directly related to the operation.

The incision used is a transverse one slightly below the umbilicus medially and just above the anterior superior spine laterally. One is usually able to retract the right rectus medially enough for adequate exposure but its section does no harm. The peritoneum is also cut transversely. In practically all cases the right lower quadrant is the site of the major work and this incision gives very good exposure of this area.

When it is determined that the intussusception is irreducible, the following steps are carried out:

1. The intussusceptum is sutured to the intussusciens, by means of mattress sutures of No. 0 chromic catgut. This step is described in the Jessett operation (Fig. 1).

2. The peritoneum is closed except for a small opening about 3 or 4 centimeters long (Fig. 2).

3. With a continuous suture, the edges of this peritoneal opening are attached to the serous surface of the intussusciens (usually the colon) at a point about 2 inches distal to the placement of the original mattress suture line uniting intussusciens and intussusceptum (Fig. 2). As shown, one can place this continuous suture so that the longitudinal band on the colon may be used in the next step. After this third step is completed the operation then becomes strictly extraperitoneal thus the danger of peritonitis is avoided.

4. The wall of the intussusciens is now opened, and the intussusceptum is pulled out and as it is pulled out toward its origin the initial mattress suture line will be felt between thumb and index finger (Fig. 3).

5. When the mattress suture knots are felt the double barreled wall of the intussusceptum is cut through one-half inch distal to the mattress suture line until both edges are clearly defined and a guy suture is placed through both walls (Fig. 4).

6. A continuous suture, running or lock, is started through both these edges, being used to maintain hemostasis as the mesenteric vessels are reached and the cutting across of the intussusceptum is continued (Fig. 4 insert). When the intussusceptum is completely severed and removed the continuous suture is completed and a second guy suture is placed opposite the first. The end-to-end anastomosis has now been completed all gangrenous tissue has been removed and the entire resection has been carried out completely extraperitoneal. The illustration (Fig. 5) shows the details.

7. A small sized catheter about No. 12 or 14 F. which will fit very loosely in the anastomotic opening is passed at least 6 or 8 inches up in the proximal ileum (Fig. 6). The two guy sutures are very helpful in this maneuver. Both guy sutures are removed and the anastomosis is allowed to resume its original position. The final result of this step is shown in Fig. 6 insert.

8. The incision in the intussusciens wall is closed rather loosely and the abdominal incision up to the catheter is also closed loosely about it. A silk stitch anchors the catheter to the skin edges so that it cannot be pulled out. This is important (Fig. 7).

Postoperatively these babies must be immobilized for about 72 hours. The catheter is attached to a continuous suction device as soon as the baby is back in bed and this suction will promptly empty the distended loops of ileum of gas and liquid matter thus allowing peristalsis to be resumed. Since the catheter goes well up in the ileum it serves exactly as an enterostomy and being much smaller in diameter than the anastomotic ring it does

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Postoperatively these babies must be immobilized for about 72 hours. The catheter is attached to a continuous suction device as soon as the baby is back in bed, and this suction will promptly empty the distended loops of ileum of gas and liquid matter thus allowing peristalsis to be resumed. Since the catheter goes well up in the ileum it serves exactly as an enterostomy and being much smaller in diameter than the anastomotic ring it does

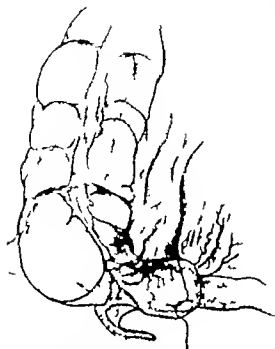


Fig. 2. Uniting intussusception to intussusceptions with parallel mattress sutures.

not plug this opening as a tightly fitting tube would. Therefore it serves a double purpose by removing the gas and liquid portions it relieves and prevents distention. It also allows the solid and semisolid matter to pass around

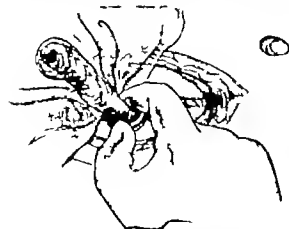


Fig. 3. The intussusception pulled out until the mattress suture line is felt between thumb and index finger. The intussusception will be sectioned one-half inch distal to this point.

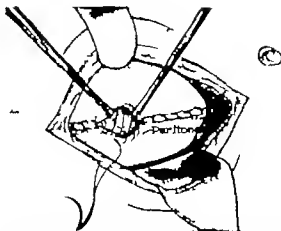


Fig. 4. The peritoneum has been closed with the excision of small opening. The peritoneal edges are being sutured to all of intussusceptions. Dotted line marks site of incision into intussusceptions.

it and to reach the colon. This promotes recovery of normal bowel action.

CASE REPORT

On December 4, 1946, Baby F, white male, aged 13 months, was admitted to St. Joseph's Infirmary to the service of Dr. Byron P. York. The obstruction had been present about 36 hours, and abdominal examination showed a lumpy mass extending from the cecal area all the way up the right side and over across the epigastric area to just a little to the left of the midline. Dr. York made a diagnosis of intussusception.

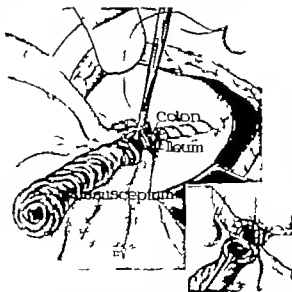


Fig. 4. First gray suture placed through all of intussusceptions and intussusception. Insert, intussusception cut half way through, running suture being placed.

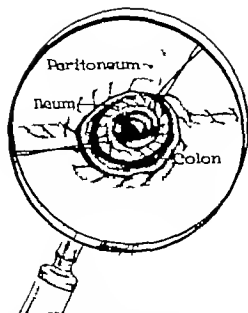


Fig. 5 Close-up view after intussusceptum has been re-moved. Placement of small sized catheter next.

and operation confirmed it. The ileum had run into itself at a point 2 inches proximal to the ileocecal junction and passed through the ileocecal valve up the ascending colon and into the transverse colon. The situation as shown in Figure 1 was present. The operative procedure was performed as illustrated and 18 centimeters of gangrenous ileum were removed. The child made a rapid recovery leaving the hospital on the sixth postoperative day. He was having normal bowel actions per rectum by the third day. There was very little fecal drainage from the colostomy which healed rapidly.

It is of historical interest that in 1905 K. Israel reported 2 cases in which finding an irreducible intussusception he sutured the colon to the peritoneum about as described here opened the colon resected the intussusceptum and sutured the double edges together to effect an end to-end anastomosis. These cases were successful and demonstrated clearly the value of the extraperitoneal resection but apparently no attention was paid to his work later. He did not suture the intussusciens to the intussusceptum as shown in Figure 1. This suturing together of the intussusceptum and intussusciens was described by Jessett who also opened the intussusciens and resected the intussusceptum about as shown here. Jessett did not do an extraperitoneal operation and apparently closed the opening in the intussusciens. Both of these two procedures represent very worth while contribu-

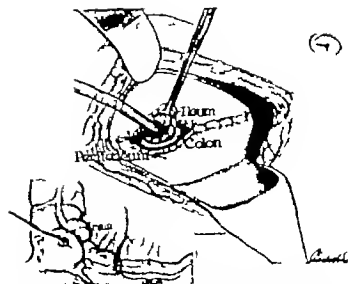


Fig. 6. Loosely fitting catheter being passed well up into proximal ileum. Insert, anastomosis allowed to slip back to original position with catheter in ileum.

tions but the procedure described here adds certain safety factors not present in either one.

This procedure may not be applicable in all cases of irreducible intussusception but where it can be used it has certain advantages of great value.

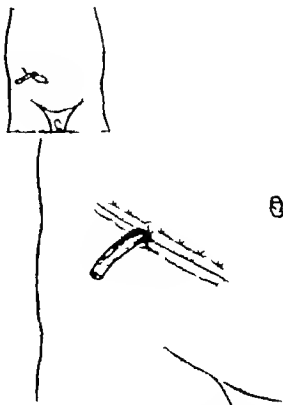


Fig. 7. Abdominal wound closed (more loosely than shown) catheter attached to skin by through-and-through silk suture.

1 It is strictly extraperitoneal after the diagnosis is ascertained and avoids the danger of peritonitis.

2 No tissue is removed that has not already been destroyed by Nature. Thus no additional shock from resection is added.

3 By means of the catheter passed up into the ileum it provides an enterostomy proximal to the anastomosis.

4 The colostomy provides an additional safety valve of great value. The method employed to provide these two safety valves does not interfere with normal bowel function but actually promotes it in every way.

5 By not removing any normal undamaged tissue there is no great loss of body fluids.

6 The operation is easily performed in a short time by an average operator. Since it can be quickly carried out and also since so little of it is actually intra abdominal, there is a minimum of shock present and this is a vital consideration.

SUMMARY

A simple, rapid, mostly extraperitoneal method for the surgical treatment of irreducible intussusception in infants is described.

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COLLECTIVE REVIEW

RATIONALE AND FACTORS FOR CONSIDERATION IN COOPER'S LIGAMENT HERNIOPLASTY

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IN the departure from the early operative procedures used in the treatment of inguinal hernia, the significance of certain technical maneuvers may be lost sight of, and when they are revived a half century later they may appear to those unfamiliar with the evolution of hernial operations as new techniques. The late Harvey Cushing said "No idea is wholly new what is new is getting people to adopt it and act upon it. How true this aphorism is when one attempts to rationalize and present a serviceable conception of myriad technical variants of hernial operations. In such an analysis it is essential that we understand not only the normal but also variations in the normal anatomical pattern which may be present prior to the development and progression of the hernia. Without such knowledge it is not possible to appreciate fully the extent of the parietal deficiency and to evaluate the existing structural distortion which the technical maneuver is intended to overcome. When it is undertaken with this knowledge the repetition of technical pitfalls may be avoided. Further any improvement of a reparative technique has a greater likelihood of success and perhaps of lasting survival if based upon anatomical knowledge fundamental physiological facts, and sound surgical principles. Cumulative knowledge of the relationship and destiny of the parietal strata is being continually enhanced through the diligence of those uniquely equipped to further meticulous anatomical dissection and embryologic research. Cur-

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rently Anson and McVay have made notable contributions in this field. Coincidentally correlative clinical application of these anatomical advances has led to a wider adoption of plastic methods in hernial repair.

The universal acceptance of the operative treatment of hernia has now spanned several decades. During this interim of more than a half century there has been increasing surgical experience, which incidentally has afforded the opportunity of introducing many variants in technique without altering the underlying basic principles of the repair. Consequently there have been few milestones in the evolutionary development of modern methods of hernial repair. In surgery as in other fields of endeavor technical procedures, new and old are repeatedly challenged, and perhaps there has been technical quiescence or even temporary regression at times, but the lull in enthusiasm has been short lived. Invariably there has followed a revival of interest which on an extended appraisal resolves any doubt as to the steady improvement in this special field of surgery.

For a quarter of a century one unvarying feature of all hernial repairs was the use of the inguinal ligament as the sheet anchor for the parietal wall. The results of this widely recognized technique, however, were not wholly satisfactory and for this reason a few surgeons (10, 24, 26, 35, 42) proposed the substitution of Cooper's ligament for the inguinal ligament which in reality was not a new idea. Gradually by the process of evolution and revival, Cooper's ligament has become recognized as playing an important auxiliary

THE RELATION OF PROTEIN DEFICIENCY TO EXPERIMENTAL WOUND HEALING

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DURING the past three decades the importance of protein metabolism in healing processes has been particularly emphasized (4, 5, 9). However, the manner in which lack of protein affects healing is still a matter of controversy. The present investigations were undertaken therefore to study further the rôle of protein deficiency in wound healing.

METHODS AND MATERIALS

In order to estimate the results a tensile strength apparatus was developed (Fig. 1). By means of slow release of air from a reservoir bottle into an intra-abdominally placed condom it was possible to measure with a manometer the amount of pressure necessary to disrupt wounds of the abdominal wall of rats. This measurement was recorded automatically with a kymograph. After the point of separation had been determined the pressure necessary to expand the condom through the previously disrupted incision was also established. The latter figure was considered the base line and represented the pressure dissipated in expansion of the balloon against the enclosing tissues of the peritoneal cavity and through the wound itself. By subtracting the point of separation from the base line an objective estimate of the tensile strength of the wound could be obtained.

Such a system is essentially a variant of that previously reported by Harvey and Howes. However, the present method tests the maximum strength of the wound, whereas in previous devices utilizing air injection the weakest part of the wound allowed escape of the air first. Furthermore, the method of elevating intraperitoneal pressure closely simu-

lates various clinical causes of wound disruption such as sudden diaphragmatic excursion and ileus with distention.

Young adult male albino rats weighing initially from 180 to 220 grams were used. These were divided into 2 groups, one of which was maintained on a low protein ration containing 1.9 per cent protein ($N \times 6.25$) and the other on a control ration containing 21.1 per cent protein (10). These diets were isocaloric and contained an adequate quantity of vitamins, minerals, and fat. Food was offered in weighed quantities daily. The protein depletion period was 3 months.

Ascorbic acid was not included in the diet because it has been found that the rat can synthesize its own complement of this vitamin. However, the ascorbic acid concentration was determined in the plasma of both depleted and control animals. The levels in both groups of animals were found to exceed 1.4 milligrams per cent.

Postoperatively the rats were maintained in individual cages and were offered 20 grams of the respective diets daily. Food consumption was measured postoperatively in 2 groups of 5 animals each for the purpose of ascertaining the caloric intake in the depleted and control animals. This was done because it has been demonstrated (2) that energy intake is a factor which conditions the utilization of protein. It was found that the normal control animals eating practically all of the diet offered had caloric intakes between 1,150 and 1,250 calories per square meter of body surface per day. The smaller protein-depleted animals which were eating slightly less of the low protein isocaloric ration had intakes between 1,350 and 1,850 calories per square meter per day.

Following the period of protein depletion the animals were fasted for approximately 8 hours, weighed, and anesthetized by the in-

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most parallel rate, the healing in the protein deficient animals lagging by a period of approximately 2 days.

Adjustment of the plasma oncotic pressure by means of gum acacia appeared to have no effect on the tensile strength of the wounds in either depleted or normal animals. Thus, on the fifth postoperative day animals on the low protein regimen alone had wounds which disrupted at an average of 62 millimeters of mercury while the wounds of those on the low protein diet plus intravenous gum acacia separated at an average tension of 65 millimeters of mercury. Animals on the control diet had wounds disrupting at an average tension of 110 millimeters of mercury while the wounds of control animals receiving gum acacia disrupted at an average pressure of 111 millimeters of mercury.

Although differences in weight between the normal controls and the depleted animals might account for the variation in the tensile strength on a given day, it does not seem likely that these weight differences could account for the overall course of the healing pattern as demonstrated in the respective dietary groups (Fig. 2).

In order to control this factor of body size observations were made on a series of young well nourished rats with body weights comparable to the protein depleted animals. In this group as a whole the tensile strength curve showed a consistent rise between the third and fifth postoperative days. On the fifth postoperative day it was found that the tensile strength of the wounds in these smaller animals fell within the range of that of the larger control animals.

Histologic examinations revealed that during the first 2 postoperative days the tensile strength was roughly proportionate to the amount and organization of the fibrin laid down at the line of incision with negligible difference between the protein depleted and control specimens. In addition, there was little evidence of fibroplasia until the third day except in occasional instances in which early activity was present in the normal control preparations. On the third postoperative day definite fibroplasia was observed, with considerable deposition of reticulum. On the

fifth postoperative day (Fig. 3a) it was seen that the fibroblastic number and activity were more pronounced in those animals fed the control ration with collagen formation and only moderate amounts of reticulum. This was in contrast to the protein depleted group (Fig. 3b) in which fibroblastic activity was obviously depressed. In the latter group reticulum was present to a greater extent along the incision and cellular response had neither the organization along lines of stress, the density nor the general maturity noted in the normal animals. Fibroplasia occurred on subsequent days with great intensity in both groups, and collagen formation was particularly pronounced in the normal animals with seemingly only a moderate quantitative cellular difference in the group of animals which were receiving less protein.

Tissue edema was absent and wound infection was not common; however in the protein deficient rats there was evidence of poorer resistance with occasional instances of abscess formation along the suture channels and occasional diffuse leucocytic infiltration. Epithelial healing was characteristically rapid in both groups with regeneration across the plane of incision by the second day after operation.

COMMENT

Further evidence is offered from these experiments that protein deficiency hampers wound healing. The effect of this deficiency has been shown to result in a characteristic delay in healing from the third through the fifth postoperative days.

In general, however within the range of protein depletion with which we worked, it was not possible to correlate serum protein levels or percentage weight loss with wound tensile strengths. Higher or lower degrees of an already well marked protein deficiency did not appear to alter the ability of the tissues to heal. A protein depleted rat which had lost 20 per cent of its body weight exhibited as poor healing as its fellow which had lost 40 per cent of its weight. Likewise rats with serum proteins as low as 3.2 grams per cent produced wounds with as great strength as those in similar animals with serum proteins of 5.0 grams per cent.

It has been claimed by Rhoads, Fleigelman and Panzer that fibroplasia occurs despite the lowered serum proteins. This finding was corroborated in the present studies by the formation of fibroblasts in both the normal and protein deficient animals. However although fibroplasia occurred in animals maintained on the low protein diet, it was marked by a delay in its early phases. Furthermore in acute depletion experiments with maintenance of the oncotic equilibrium it is possible that serum protein levels will not reveal the extent of protein reserves and the ability of the body to regenerate tissue however in chronic protein deficiency a lowered serum protein appears in general to indicate tissue protein loss (8) and in addition impairment of healing.

An interesting question may be raised. Is the delay in wound healing related merely to the presence of a negative nitrogen balance or is the effect due to exhaustion of the protein reserves coupled with the negative nitrogen balance?

In addition to the loss of circulating and tissue protein other associated elements undoubtedly contribute to the disturbed healing. In animals rendered hypoproteinemic by plasmapheresis wound disruption has been shown to occur frequently (9). This result has been attributed to disturbed osmotic relationships and has been prevented by the administration of acacia to maintain oncotic equilibrium (7). The importance of osmotic equilibrium in wound disruption has likewise been emphasized by Koster and Shapiro and they have stressed particularly the importance of the serum albumin fraction in maintaining a normal osmotic system.

Under the conditions of the present study the animals appeared to be in a relatively normal state of fluid equilibrium. They were not grossly edematous. The ratio of carcass water to carcass protein was not significantly disturbed (2). This was true despite the hypoproteinemia and the large tissue loss. It is possible that this was in part due to the relatively high potassium content of the diet (10) with its resultant diuretic action (2). Thus it seems unlikely that edema played any major rôle in the retardation of wound healing observed in these protein deficient animals. The

experiments in which the colloid osmotic pressure of the plasma of the depleted animals was elevated by the injection of gum acacia substantiate this conclusion.

It should be pointed out however that under situations of stress on the fluid regulatory mechanism such as the sudden flooding of the system with excess fluid and salt, edema is much more likely to occur in the hypoproteinemic animals than in the normal. Such edema will undoubtedly add to the difficulties of repair already present in the protein deficient tissues.

SUMMARY AND CONCLUSIONS

1. A method is described for measuring the tensile strength of wounds of the abdominal wall in small animals.

2. The healing of incised wounds of the abdominal wall of rats is delayed in protein deficient animals.

3. With the onset of fibroplasia on the third postoperative day there is in general a marked difference in the tensile strength of the wounds of the animals maintained on the two rations. This difference is most apparent on the fifth day at which time the wounds of the animals on the normal diet are 3 times as strong as those of the animals on the low protein diet. On subsequent days the strength of the wounds rise in parallel fashion those of the low protein group lagging by approximately 2 days.

4. The lowered tensile strength of wounds noted in protein deficient rats during the third to fifth postoperative days is apparently due to (a) diminution in the number of fibroblasts and a decrease in their rate of maturation, and a general failure of the fibroblasts to organize with adequate density along the lines of stress and (b) delay in maturation of the reticulum into mature collagen.

5. No relationship was demonstrated between various concentrations of the lowered blood protein and wound tensile strength nor with respect to the degrees of weight loss and tensile strength. However in the presence of serum protein depletion and marked weight loss, the wounds invariably exhibited a characteristic although moderate delay in the early phases of fibroplasia.

6 Wounds of rats maintained on an adequate protein diet usually heal cleanly by primary intention, whereas those of rats fed a low protein ration tend to heal with more wound infections and excess wound secretions.

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PAPILLARY CARCINOMA OF THE THYROID AND LATERAL CERVICAL REGION

So called 'Lateral Aberrant Thyroid

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IN 1939 I reported in this journal a series of 13 cases of papillary tumors of lateral aberrant thyroid origin followed for an average period of 4 years after operation. At that time the literature contained no reports of proved distant metastasis from this type of tumor and in none of our cases had distant metastasis occurred. I concluded therefore that these tumors were multiple primary benign or locally malignant lesions arising simultaneously in the thyroid and lateral cervical region as a result of some disturbance in the development of the lateral anlage of the thyroid. It did not seem plausible to believe that the lateral cervical nodules frequently 10 to 20 in number could represent metastasis from a carcinoma of the thyroid and that at the same time all the patients could be cured by simple removal of the thyroid and lateral cervical tumors. In view of the excellent prognosis it seemed more reasonable to consider these tumors as multiple primary relatively benign neoplasms.

Eight years have passed and 9 new cases have been added to the list. All 21 of these patients have been followed for from 5 to 20 years or until their death. The survival record of these patients still lends support to the theory that in some cases at least the lateral cervical nodules are multiple primary tumors of benign behavior. Yet in 1 case we have in controvertible proof of the malignancy of these tumors and of their ability to metastasize distantly and in a second there is strong evidence that this is the case. Similar examples of distant metastasis have been reported by Pemberton (2) Lahey and others since 1939. In view of the continuing controversy

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One has been eliminated because analysis does not indicate with certainty that the nodule was not removed from the thyroid rather than from the lateral cervical region. As this patient had died without recurrence at the time of the previous report it does not materially alter the series.

over the true nature of these lesions and treatment of choice it seems fitting to report the present status of these 21 cases (Table I).

Two patients have died with distant metastases one to the brain (not proved) and one to the axilla and mediastinum (proved by biopsy). One patient died with a local recurrence of the thyroid tumor. Two have died of other causes apparently free from cancer 84 months and 59 months respectively after operation. One patient, who has had only a biopsy is alive and well 20 years with multiple tumors in both lobes of the thyroid and throughout both cervical regions. One patient (previously reported) died after operation (1). The remaining 14 patients are alive and well with no evidence of local recurrence or distant metastasis.

The 3 patients who died as a result of recurrence or metastasis of the tumor died 18 years, 15 years and 9 years respectively after their original operations. Similar cases have been reported by others and hence we must conclude that in dealing with this type of cancer 5 years is no measure of a cure. The thyroid and lateral cervical region of the patient who has persistently refused operation and irradiation for 20 years is filled on each side with nodules ranging in size from 1 to 3 centimeters in diameter. Although the tumors are much more numerous than they were at first, they have never attained such a size as to produce symptoms or a significant visible deformity of the neck. The fact that the number of tumors has increased from 3 to 20 or more suggests metastasis but could be interpreted as the progressive appearance of multiple independent tumors of congenital origin.

One of the 3 patients who have died of carcinoma developed a massive local recurrence 15 years after the original thyroidectomy. Associated with the recurrence was a single lat

TABLE L.—SUMMARY OF 21 CASES

Case Age at operation	First operation and date of operation	Preoperative size of tumor	Size of tumor at operation	Number and type of operation	Number and location of nodules	Radical thyroid tumor	Size of thyroid tumor	Operation on thyroid	Location of recurrence	Schroeder's thyroid tumor	Associated lesions	Pathology	Present status
1 F 35	Lateral cervical tumor 15 mm.	Single nodule		Removal of nodule	2, Cervical	-	-	-	-	-	-	Pathology adenoma	Dead after cancer free of recurrence proved by autopsy and later examination
2 F 35	Lateral cervical tumor 15 mm.	Single nodule		Large neck dissection thyroidectomy removal of nodule removal of nodule removal of nodule	4, large and small nodules central and lateral in thyroid	1 cm.	1 cm.	Complete thyroidectomy	Median incision	-	-	Pathology adenoma	No recurrence free of recurrence proved by autopsy and later examination
3 F 35	Lateral cervical tumor 75 mm.	Correct		Large neck dissection thyroidectomy removal of nodule removal of nodule removal of nodule	7, large and small nodules central and lateral in thyroid	3 cm.	3 cm.	Complete thyroidectomy	-	None formation	-	Pathology adenoma	No recurrence free of recurrence proved by autopsy and later examination
4 F 35	Lateral cervical tumor 15 mm.	Correct		Large neck dissection thyroidectomy removal of nodule removal of nodule removal of nodule	4, large and small nodules central and lateral in thyroid	3 cm.	3 cm.	Complete thyroidectomy	Cervical dissection at level of the tumor	-	-	Pathology adenoma	No recurrence free of recurrence proved by autopsy and later examination
5 F 35	Lateral cervical tumor 24 mm.	Correct		Removal of nodule thyroidectomy removal of nodule removal of nodule removal of nodule	4, middle cervical	-	-	Complete thyroidectomy removal of nodule removal of nodule removal of nodule	-	-	+	Pathology adenoma	No recurrence free of recurrence proved by autopsy and later examination
6 F 35	Hyperthyroidism	Multiple nodules with hyperthyroidism		Removal of nodule thyroidectomy removal of nodule removal of nodule removal of nodule	3, middle cervical	-	-	Complete thyroidectomy removal of nodule removal of nodule removal of nodule	-	-	+	Pathology adenoma	Dead after cancer free of recurrence proved by autopsy and later examination
7 F 35	Thyroid tumor 15 mm.	Correct		Removal of nodule thyroidectomy removal of nodule removal of nodule removal of nodule	4, middle cervical	cm.	cm.	Complete thyroidectomy removal of nodule removal of nodule removal of nodule	Median incision	Colloid	+	Pathology adenoma	Dead of cancer free of recurrence proved by autopsy and later examination

TABLE 1.—SUMMARY OF 21 CASES—Continued

[illegible]

TABLE L—SUMMARY OF 21 CASES—Continued

Case No.	First operation on cervix	Second operation on cervix	Third operation on cervix	Fourth operation on cervix	Number and location of nodules	Subtotal of cervical nodules	Subtotal of nodules	Size of largest nodule	Operation on thyroid	Location of recurrence	Subtotal of nodules	Pathology	Prognosis
12	Partial thyroidectomy	Radical thyroidectomy	Corrective thyroidectomy	Corrective thyroidectomy	4, middle cervical			3 cm	Complete lobectomy	PT, post-operative scar tissue, nodules, cervical, enlarged, slowly, resected, 7 yrs later	+	Papillary adenoma	No recurrence well 91 mo 61 yr ago
13	Partial thyroidectomy	Radical thyroidectomy	Corrective thyroidectomy	Corrective thyroidectomy	4, middle cervical			3 cm	Partial thyroidectomy	Partial thyroidectomy, nodules, cervical, slowly, resected, 7 yrs later	+	Papillary adenoma	No recurrence well 91 mo 61 yr ago
14	Partial thyroidectomy	Radical thyroidectomy	Corrective thyroidectomy	Corrective thyroidectomy	4, middle cervical			3 cm	Partial thyroidectomy	Partial thyroidectomy, nodules, cervical, slowly, resected, 7 yrs later	+	Papillary adenoma	No recurrence well 91 mo 61 yr ago
15	Partial thyroidectomy	Radical thyroidectomy	Corrective thyroidectomy	Corrective thyroidectomy	4, middle cervical			3 cm	Partial thyroidectomy	Partial thyroidectomy, nodules, cervical, slowly, resected, 7 yrs later	+	Papillary adenoma	No recurrence well 91 mo 61 yr ago
16	Partial thyroidectomy	Radical thyroidectomy	Corrective thyroidectomy	Corrective thyroidectomy	4, middle cervical			3 cm	Partial thyroidectomy	Partial thyroidectomy, nodules, cervical, slowly, resected, 7 yrs later	+	Papillary adenoma	No recurrence well 91 mo 61 yr ago
17	Partial thyroidectomy	Radical thyroidectomy	Corrective thyroidectomy	Corrective thyroidectomy	4, middle cervical			3 cm	Partial thyroidectomy	Partial thyroidectomy, nodules, cervical, slowly, resected, 7 yrs later	+	Papillary adenoma	No recurrence well 91 mo 61 yr ago
18	Partial thyroidectomy	Radical thyroidectomy	Corrective thyroidectomy	Corrective thyroidectomy	4, middle cervical			3 cm	Partial thyroidectomy	Partial thyroidectomy, nodules, cervical, slowly, resected, 7 yrs later	+	Papillary adenoma	No recurrence well 91 mo 61 yr ago
19	Partial thyroidectomy	Radical thyroidectomy	Corrective thyroidectomy	Corrective thyroidectomy	4, middle cervical			3 cm	Partial thyroidectomy	Partial thyroidectomy, nodules, cervical, slowly, resected, 7 yrs later	+	Papillary adenoma	No recurrence well 91 mo 61 yr ago
20	Partial thyroidectomy	Radical thyroidectomy	Corrective thyroidectomy	Corrective thyroidectomy	4, middle cervical			3 cm	Partial thyroidectomy	Partial thyroidectomy, nodules, cervical, slowly, resected, 7 yrs later	+	Papillary adenoma	No recurrence well 91 mo 61 yr ago
21	Partial thyroidectomy	Radical thyroidectomy	Corrective thyroidectomy	Corrective thyroidectomy	4, middle cervical			3 cm	Partial thyroidectomy	Partial thyroidectomy, nodules, cervical, slowly, resected, 7 yrs later	+	Papillary adenoma	No recurrence well 91 mo 61 yr ago

TABLE I—SUMMARY OF 21 CASES—Continued

Case	First symptom and date of operation	Palpable tumor in thyroid	Prophylactic thyroidectomy	X-ray of thyroid	Number and type of operation	Location and number of nodules	Bilateral cervical nodule	Bilateral thyroid tumor	Size of thyroid tumor	Operation on thyroid	Location of recurrent tumor	Sclerosis of thyroid tumor	Associated benign adenoma	Pathology	Present status
9	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•
10	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•
11	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•
12	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•
13	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•
14	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•
15	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•
16	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•
17	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•
18	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•
19	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•
20	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•
21	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•

eral cervical nodule grossly and histologically identical to the tumors that in the past we have called lateral aberrant thyroids. There was present in this case the rich pedicle of blood vessels so characteristic of the lateral aberrant thyroids and so different from the blood supply of other types of metastases in lymph nodes. Yet metastatic carcinoma histologically identical to that seen in the thyroid and lateral cervical region was later found in the axilla. It is inconceivable that axillary thyroid tissue could be of congenital origin. The patient died 4½ years after the second operation and over 19 years after removal of the original papillary tumor.

The second patient was reoperated upon for a local recurrence of the thyroid tumor 9 years after the original operation and again a single lateral cervical nodule grossly and histologically similar to those described as lateral aberrant thyroids, was found. Six years later (15 years after the original carcinoma of the thyroid was removed) this patient died, apparently with cerebral metastasis, although a postmortem examination was not done.

The third patient developed a large carcinoma of the thyroid which appeared a few months after a lateral cervical nodule was removed. In spite of x ray therapy she died with local recurrence of the tumor 9 years after the original operation.

The remarkable survival record of the other patients with or without surgical removal of the tumors is demonstrated in the table.

The ability of these tumors to metastasize, as shown by the reports of Pemberton (2) Lahey and others and by the progress of our patients since they were reported in 1931 indicates that regardless of their histology and regardless of their relatively benign clinical behavior these tumors must be considered malignant. Yet they must be considered in a separate category of malignancy one in which metastasis is recognized yet cognizance is taken of the usual tendency to grow extremely slowly. They can be characterized as having the following qualities:

1. A marked tendency regardless of histologic criteria of malignancy to metastasize locally to the glands of (a) the lower and mid cervical region behind and about the carotid

sheath (b) the region posterior to the thyroid along the trachea and along the course of the recurrent nerve (c) the superior mediastinum, (d) the posterior triangle of the neck (e) the upper part of the neck in relation to the carotid sheath (f) the midline along the thyroglossal tract, (g) possibly contralaterally although usually a second primary tumor in the other lobe is demonstrable.

2 A slight tendency to metastasize distantly (a) via the blood stream especially to the lungs (b) via the lymphatics to the axilla.

3 A marked tendency for the tumor in the thyroid to calcify scanty or even to ossify the primary tumor often failing to enlarge significantly over a period of many years in spite of the fact that its metastases may show steady growth and increasing numbers.

4 A tendency for the lateral cervical metastases to grow only slowly over a period of many years and to remain encapsulated non-invasive, and freely movable.

A primary tumor has been found in the thyroid gland of every one of 16 consecutive cases in which I have explored the thyroid or removed one of its lobes. Aside from the 4 tumors that we have observed in both lobes of the thyroid all others in the thyroid proper have been single primary tumors. In 3 cases the tumor has infiltrated the gland more or less diffusely forming an adenopapillomatous infiltration of the affected lobe, but in no cases has there been more than one distinct tumor nodule in a lobe of the thyroid. The fact that in the 16 consecutive patients whose thyroids I have explored there have been multiple lateral cervical nodules and only one nodule in the lobe of the thyroid would seem an argument against the hypothesis that the tumor in the thyroid is, as some believe a metastasis from a primary malignancy in the lateral cervical region. These observations tend to substantiate Pemberton's theory that most, if not all, of the lateral cervical nodules are metastases of a carcinoma primary in the thyroid.

Against this view we have 5 patients followed for from 5 to 14 years after removal of a lateral cervical nodule who have never developed any palpable tumor in the thyroid. That this does not rule out the presence of a primary tumor in the thyroid is illustrated by an

additional case in which 6 years intervened between the removal of a lateral cervical nodule and a second operation for recurrent lateral cervical nodules. Prior to the second operation no tumor was palpable in the thyroid yet at the time of the second operation a tumor 1.5 centimeters in diameter was found in the lobe on the affected side. The tumor was surrounded by much dense scar tissue. It is quite likely therefore that many of the primary tumors in the thyroid enlarge little at all over a period of many years and so may escape detection unless they are searched for. Yet these same tumors may as in this case continue to give rise to actively growing metastases while the primary tumor fails to enlarge.

Experience has shown that even a partial lobectomy does not rule out the presence of a small primary tumor. I have recently removed a papillary carcinoma of the thyroid and a number of lateral cervical nodules a little over a year after a "thyroidectomy" had been performed. At the time of the first operation neither the surgeon nor the pathologist was aware of the presence of this tumor which as is so often the case lay on the posteromedial aspect of the thyroid an area avoided by many surgeons. On another occasion before I became aware of the significance of the lateral cervical nodules in respect to the thyroid tumor I explored the thyroid of a girl with lateral cervical nodules and reported it normal only to reoperate for recurrent cervical nodules a year later and find that there was indeed a tiny nodule less than 1 centimeter in diameter on the posteromedial aspect of the thyroid. Thus failure to demonstrate a tumor in the thyroid at operation or in the portion of the gland removed does not by any means rule out the possibility that a tumor in the posteromedial remnants was overlooked.

The extreme slowness of growth of certain of the tumors in the thyroid is illustrated by the case of a girl 20 years old whose thyroid contained a nodule estimated to be 1.5 centimeters in diameter. Lateral cervical nodules were removed but the thyroid tumor was not disturbed. Fifteen years later more lateral cervical nodules and the thyroid tumor were removed but after all these years the tumor

and in some instances, fundamental, role in her nioplasty. The employment of this ligament augments the security of the floor and presents points of surgical excellence not possessed by transfixion of the wall to the inguinal ligament.

Many technical variants in the practical application of Cooper's ligament have been described but the criteria for the use of this ligament as contrasted with the inguinal ligament have not been presented in the literature. Several factors may be responsible for this missing link in the progressive use of Cooper's ligament for repair. A discussion of some of these factors is the purpose of this paper. It will be confined to (1) the evaluation and availability of Cooper's ligament, (2) reasons for lack of more general acceptance of hernioplasty with Cooper's ligament, and (3) the proposal of criteria for its employment. A description of our technique and a statistical analysis of our results are in preparation.

COOPER'S LIGAMENT

Of the surgically important ligaments of the inguinal region, the iliopectineal (Cooper's) is perhaps the least known generally yet, in 1804 it was described by Sir Astley Cooper who was the first to propose its use in the repair of femoral hernia. However the clinical application of Cooper's proposal was not realized until 1876 when Annandale employed this ligament in the closure of the femoral ring following ligation of the femoralized sac. This operation antedated by 11 years the publication of Bassini's classical and world renowned technique for the repair of inguinal hernia with Poupart's ligament. To Lothelsen (1898) and to his contemporary Narath, are given the distinction of being the first to use Cooper's ligament in the repair of inguinal hernia. Incidentally Lothelsen was operating on a recurrent inguinal hernia when he discovered that Poupart's ligament was totally inadequate and did not exist as an integral structure. Consequently out of dire necessity and drawing on his fund of anatomical knowledge he exposed Cooper's ligament to which he transfixed the conjoined tendon. Despite Lothelsen's resourcefulness and his success in 11 repairs, there followed a long interim in which the use of this ligament was abandoned. Its use was subsequently revived by Moenchowitz, Scellig and Tuholake, Dickson, McClure and Fallis, and others (18, 32-35). In striking contrast, during the same period there was remarkable progress made in the treatment of indirect and direct hernias by employment of the inguinal ligament with disregard of the potentialities of the underlying deeper ligamentous structure. This con-

ing revolutionary concept in the development of hernial operations, with the use of Cooper's instead of Poupart's ligament, was brought about by the introduction of the Bassini-Halsted techniques which was given wide publicity in the medical journals of the Continent and America. The simplicity of the latter and the feature of repositioning the cord gained rapid acceptance which has survived perennial challenges for a half century.

The fascial composition of Cooper's ligament has been variously described. Authorities, however are generally agreed that no fascia is basic in its formation but represents fusion of adjacent closely anatomically and generically related fascial and aponeurotic planes, the fascia transversalis, the lateral expansion of the rectus insertion, and the pectineus fascia. Cooper's ligament is pyriform, remarkably constant, and of unvarying density. It is adherent to the superior pubic ramus and intimately attached to the iliopectineal line. It has an internal or vertical surface and a dense superior almost flat surface. The underlying pecten of the ramus is ridge-like which produces the overlying angulation of the ligament at the juncture of its vertical and superior surfaces. Some French and German anatomists have enumerated in minute detail the fascial, tendinous, and aponeurotic structures that conjoin to form Cooper's ligament, but which actually are of little practical surgical importance. A review of the current literature strikingly illustrates that former obstacles to the use of Cooper's ligament are being overcome and the acceptance of this type of hernioplasty as one of the standard techniques is decidedly on the increase. In the broader concept there is no dissent regarding the gross anatomical demarcations or structural sufficiency of this ligament. Further it possesses certain strategic advantages not inherent in the inguinal ligament. Its boundaries do not become distorted by the herniated mass; there is no alteration in its topographic classification, and it does not become attenuated or fragmented. This ligament is not so easily accessible as the inguinal ligament and confusion persists in regard to its terminology.

REASONS FOR RELUCTANCE IN ACCEPTING COOPER'S LIGAMENT IN HERNIA REPAIR

Tardiness of the profession in general in accepting the use of Cooper's ligament in hernia repair may be attributed to the following reasons:

1. The decided lack of accurate and detailed knowledge or available textbook references to this ligament. This deficiency in knowledge of the sponenrotic and fascial continuities encountered

in the thyroid was only 2 centimeters in diameter. The fact that no tumor appears in the thyroid even 10 or 15 years after removal of lateral cervical nodules does not therefore prove that there is no primary tumor in the thyroid. It means only that in all probability the tumor in the thyroid is very small, lies deep on the posterior surface of the gland and is either growing very slowly or its growth is prevented by calcification and scarring.

One of the most significant features of these tumors is the fact that in every one of the 16 patients with lateral cervical nodules whom I have explored I have found a tumor in one or both lobes of the thyroid. The fact that in 5 cases tumors were found in both lobes of the thyroid suggests that the thyroid tumors originate in some congenital rest or anomaly of development. The youth of the patients (6 had developed lateral cervical nodules by the age of 20) also suggests a congenital origin, as does the histologic appearance of some of the cervical nodules. Yet in other cases the lateral cervical nodules are clearly metastases in lymph nodes and it is therefore reasonable to assume that most if not all of the lateral cervical nodules are metastases from the thyroid.

Regardless of the origin of these tumors or of their classification in respect to malignancy, their treatment should be surgical excision. It is indeed a strange type of cancer that can be controlled for 15 or 20 years by local excision of the primary tumor and individual removal of 15 or 20 or more metastatic nodules. It is also a curious type of malignancy which without any form of treatment grows so slowly that in over 20 years the nodules have not enlarged appreciably and have merely become more numerous. It is almost as if these tumors were metastasizing congenital rests having little or no energy of growth. Yet in other cases the tumors enlarge fairly rapidly and sometime attain considerable size. When the primary tumor of the thyroid rather than the lateral cervical nodules is noticed first, the growth energy appears to be greater. Three of the 4 patients who eventually died as a result of tumor developed a bulky tumor of the thyroid as the initial symptom. There were only 2 other patients in the entire group whose thyroid tumors were noticed before the lateral

cervical nodules. The patients whose initial symptoms are referable to bulky tumors of the thyroid and in whom lateral cervical nodules are late developments should perhaps be placed in a different category from those in whom the lateral cervical nodules are the initial and most striking manifestations of the disease.

Complete removal of the tumors involving the posteromedial aspect of the thyroid and of the metastatic nodules along the trachea and the course of the recurrent nerve is often very difficult. The scarring and calcification of the tumors in this location render them adherent and often make it difficult to identify, isolate and preserve the recurrent nerve. If a meticulous dissection of the nerve is made however it is usually possible to preserve it. Often it is necessary to isolate and dissect out the entire cervical portion of the nerve. Even when it is adherent to the tumor it may be possible to separate it from the mass without either leaving tumor tissue or damaging the nerve. On several occasions it was impossible to save the nerve without leaving tumor tissue and hence after dissecting it out it was necessary to sacrifice it. When the choice lies between sacrifice of the nerve and removal of all tumor the nerve should be sacrificed.

It is apparent from the table that most of the patients in this series have had more than one operation and that some have had three. All of the patients who have had three operations were operated upon early in our experience before we were aware of the fact that a tumor is usually if not always present in the thyroid. Metastasis therefore continued to occur from the thyroid tumor until it was removed.

Even after the importance of the thyroid tumor was recognized many of the patients with 15 or more lateral cervical nodules required a second operation for removal of one or more overlooked nodules. In several instances the recurrence was contralateral or mediastinal and in one it was in the thyroglossal tract. In only 1 case was the recurrence in the field of the first operation and only in this case would a block dissection of the neck have eradicated the tumor more completely than mere removal of the nodules.

In most of the patients the recurrences were first noticed within a few months of the first operation, and most of these patients were operated upon promptly and have remained well for from 5 to 10 years. In 2 instances the recurrences were noted early but operation was deferred as the result of the war for 4 or 5 years. The nodules enlarged only very slowly and no more nodules developed, again suggesting that if the source of the trouble in the thyroid is eradicated the tendency for additional lateral cervical nodules to develop is controlled.

CASES ILLUSTRATING SLOWNESS OF GROWTH

A patient was seen in 1925 complaining of lumps in the neck of 6 years' duration, first noticed at the age of 16. Several large soft glands were palpable in the left lateral cervical region. A diagnosis of tuberculous adenitis was made. Three x-ray treatments (2 with 30 per cent erythema dose and 1 with 50 per cent) were given without benefit. A biopsy was reported as revealing metastases of a papillary carcinoma of the thyroid. An aberrant papillary adenoma of the thyroid. The patient refused further treatment. In 1939, 14 years later the patient had a hard tumor 2.5 centimeters in diameter in the left lobe of the thyroid, a hard tumor 1 centimeter in diameter in the midline above the isthmus, as well as a tiny hard nodule in the right lobe of the thyroid and numerous lateral cervical nodules beneath the sternomastoid on each side. None of these nodules was large enough to be visible except the one above the isthmus. In 1946, 3 years after biopsy and 27 years after the nodules had first been noticed the patient writes that she has no symptoms referable to the tumors and has only one small tumor in the front of her throat.

A woman, aged 35, first noted glands in the right side of her neck a year before entry. There was a large round fluctuant cystic mass 6 centimeters in diameter at the base of the neck on the right under the sternomastoid. There was a firm nodule 3 centimeters in diameter in the superior pole of the right lobe of the thyroid and two firm round masses 2 centimeters in diameter under the sternomastoid on the right. A diagnosis of tuberculous adenitis or branchial cyst was made. Eleven light x-ray treatments were given without improvement. Four of the lateral cervical masses were removed and the pathologist reported multiple cervical papilliferous cysts of the lateral aberrant thyroid. The thyroid was not explored. The patient returned 14 years after operation and more than 16 years from the time the tumor was first noticed. She had no symptoms referable to the cervical tumors, but examination revealed a hard nodule 3 centimeters in diameter at the right lobe of the thyroid and bilateral cervical nodules. The left lobe of the thyroid seemed normal.

At operation there was a partly calcified papillary carcinoma of the right lobe of the thyroid gland 3 centimeters in diameter and a similar tumor 1 centimeter in diameter in the left lobe. There were 8 lateral cervical nodules, some present on each side in the neighborhood of the thyroid as well as posterior to the carotid sheath and in the superior mediastinum. Convalescence was uneventful and 3 months later there was no evidence of recurrence. This case is interesting because it shows how long these tumors can be present in the thyroid without enlarging appreciably or causing symptoms other than those referable to the lateral cervical metastases. It also indicates that as was the case in the left lobe a tumor may be present without being palpable prior to operation.

CASES SHOWING THAT METASTATIC NODULES MAY CONTINUE TO DEVELOP UNTIL THE PRIMARY TUMOR IN THE THYROID IS REMOVED

A girl, aged 18, had noticed lumps in the right lateral cervical region for 3 years. Later similar lumps developed on the left side and enlarged steadily. A biopsy of one of the lumps was reported as metastatic adenocarcinoma. Twenty-one x-ray treatments with a total of 4000 r units were given, and the nodules decreased slightly in size for a few weeks and then began to enlarge again. Examination revealed nodules 3 centimeters in diameter beneath the sternomastoid on each side, but no abnormality of the thyroid was noted. Through a thyroidectomy incision Dr. George Crile, Sr. removed 5 cystic nodules from the region of the carotid sheath on each side. One of the tumors was removed from the mediastinum at the level of the arch of the aorta. The thyroid was examined and reported as normal. The pathologist reported the tumors as multiple benign intracystic papillomas of lateral aberrant thyroid origin.

Six months later the patient noticed a recurrent tumor in the right lateral cervical region. Examination showed several small firm nodules behind the lower part of the sternomastoid on the right and an enlargement of the left lobe of the thyroid. At operation a tumor 3 centimeters in diameter was removed from the region of the carotid sheath on the right. The left lobe of the thyroid containing a tumor 1 centimeter in diameter also was removed. The right lobe of the thyroid was examined and found to be normal. The pathologist reported a small localized papillary adenomatous growth in the left lobe of the thyroid. It was thought that this tumor and the lateral cervical nodule, which was of similar histology, were both benign.

The patient remained well for 3 years and then developed a small firm nodule in the right lobe of the thyroid 1 centimeter in diameter. At operation the right lobe of the thyroid containing a small tumor was removed and 9 separate nodules were removed from the lateral cervical region and superior medi-

astinum. The pathologist again reported papillary adenomas of the thyroid and of lateral aberrant thyroid origin.

It is over 6 years since the last operation and the patient has had no further recurrences. It was not until the 2 primary tumors in the thyroid were resected that the lateral cervical nodules stopped forming.

A woman, aged 39, had developed a lump in the right side of her neck 3 years before entry. In 1932 Sir John Fraser had removed aberrant thyroid tissue from the right side of her neck at the Royal Infirmary, Edinburgh, Scotland. Shortly after operation the lump reappeared. It was again removed in 1936.

Examination showed a nodule 2.5 centimeters in diameter beneath the lower part of the sternomastoid on the right. The thyroid was normal.

In 1937 Dr. George Crile Sr. removed a nodule from the region of the carotid sheath low on the right. It was reported as a cystic papillary adenoma of lateral aberrant thyroid.

A month later another tumor was noticed in the same location and 5 months later 3 papillary adenomas were removed from the same region. A month later there were no masses palpable in the lateral cervical region but a tiny nodule could be felt in the thyroid gland. The patient returned to England but her sister informs us that the patient has had several more nodules removed from her neck. It is now 15 years since the onset. I do not doubt that she will continue to form nodules until the primary tumor in the thyroid is removed.

CASES ILLUSTRATING GOOD PROGNOSIS IN SPITE OF EXTENSIVE METASTASIS

The following cases in which there were 20 or more lateral cervical nodules illustrate the excellent prognosis (at least for the first 5 or 10 years) which may follow surgical removal of the primary tumor in the thyroid and lateral cervical nodules, regardless of their number and distribution.

A boy was first seen at the age of 10 at which time he had a soft diffuse enlargement of the thyroid which was treated as an adolescent goiter by administration of iodine. The thyroid was examined repeatedly for the next 9 years and no abnormality of the thyroid other than a slight diffuse enlargement of the entire gland was noted.

At the age of 19 he developed nodules in both lateral cervical regions from the angle of the jaw to the clavicle and a hard nodule the size of a pea in the right lobe of the thyroid. A diagnosis of carcinoma of the thyroid with metastasis was made and through anterior sternomastoid incisions dissections of the neck were performed without removal of either jugular vein or sternomastoid muscle. There were tu-

mors in both lobes of the thyroid. All of the right lobe and almost all of the left lobe were removed. Numerous lateral cervical nodules estimated at over 20 on each side were removed from the region posterior to the thyroid from the superior mediastinum and from along the entire length of the carotid sheath. One month later 2 nodules were noted beneath the angle of the jaw on the right at the upper aspect of the previous operation. These were removed. The pathologist reported papillary carcinoma of both lobes of the thyroid with bilateral metastasis to the cervical glands. The tissue was very cellular having some tendency to form glands, papillomatous growths, and large solid masses of closely packed cells. The patient has remained well and free of recurrence for over 6 years and x-ray examination of the chest shows no abnormalities.

Three other patients with extensive thyroid and lateral cervical involvement by carcinoma each of whom had 25 or more lateral cervical nodules and one of whom had a frank malignancy with invasion of veins by the tumor are well from 8 to 10 years following operation. These are Cases 1, 2, and 4 reported previously in this journal (2, 3).

It is clear therefore that the prognosis in these cases is not entirely dependent either on the histologic appearance of the tumor nor on the extent of the lateral cervical metastasis. The 4 patients who have died as the result of papillary tumors of the thyroid with lateral cervical nodules all had tumors which were originally reported as benign from a histologic standpoint, and in 3 of the 4 cases metastasis to the lateral cervical region did not appear for many years. It is urged, therefore, that regardless of the extent of the lateral cervical metastasis and regardless of the apparent malignancy of the lesion papillary tumors in the thyroid lateral cervical region and mediastinum should be removed surgically. Since none of the 3 patients in this series who had adequate x-ray treatment showed either primary regression or permanent control of the tumor x-ray cannot always be relied upon to control this type of cancer. We have reserved its use for those cases in which surgery has failed.

SUMMARY

1. Twenty-one cases of papillary carcinoma of the thyroid and lateral cervical region are reported.
2. All patients have been followed from 5 to 21 years or until their death, and only 3 have

died from cancer 1 with local recurrence in the thyroid and 2 with distant metastasis.

3 The patients who died of cancer lived for 9, 15, and 19 years, respectively after the original thyroidectomy.

4 One patient who has refused all treatment is living and well 27 years after the appearance of lateral cervical nodules and 21 years after these nodules were proved to be papillary tumors of the thyroid.

5 In judging the results of treatment of papillary carcinoma of the thyroid the usual 5 year period is meaningless. Twenty or more years may be required before one can be sure that the patient is cured.

6 In 16 consecutive cases with papillary tumors of the lateral cervical region, when the thyroid was carefully examined, a primary tumor in the thyroid was found.

7 It is thought that the lateral cervical nodules are probably metastases from a tumor of the thyroid rather than, as I previously believed, primary tumors of congenital origin.

8. Lateral cervical tumors may continue to form until the primary tumor in the thyroid is removed. Following this no more lateral cervical nodules appear.

9. In the few cases in which x ray has been given the results have been disappointing.

10. The results of excision of the primary tumor and the lateral cervical and mediastinal metastases have been excellent. Four patients who had 20 or more lateral cervical and mediastinal nodules are well and free of re-

currence for from 6 to 10 years after operation.

11 The lateral cervical nodules rarely invade muscles or blood vessels and block dissection of the neck is therefore not necessary. Since most of the patients are young women, whose necks one would hesitate to mutilate needlessly by a block dissection, it is an advantage to perform the operation through a thyroidectomy incision or in the more extensive cases through an incision parallel to the sternomastoid.

12 The tumor in the thyroid may be very small and often is not palpable before operation. On several occasions it was not found until the gland was rotated up out of its bed to expose the posteromedial surface.

13 The tumor in the thyroid usually is scarred or calcified and may not enlarge appreciably over a period of many years in spite of the fact that it continues to give rise to lateral cervical metastases.

14. Regardless of the histology of the tumors and regardless of their apparent hopelessness as suggested by the extent of metastasis, the primary tumor in the thyroid and the lateral cervical and mediastinal metastases should be excised.

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COMMON AND UNCOMMON PATHWAYS IN THE SPREAD OF TUMORS AND INFECTIONS

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THE rationale of surgical intervention in the spread of tumors and infections is by necessity based on a knowledge of the pathways for the propagation of these noxious agents. This is where the anatomist enters the field. It is his function in co-operation with the pathologist to map out the channels along which the spread takes place. As different as their pathology is the avenues along which cancers and infections travel, are essentially the same, namely the blood and lymph channels. This is the reason why the two disease entities have been combined in the title of this paper. It is certain that we have here a very fruitful field for anatomical research and that many of the peculiarities of metastatic distribution can be explained only on the basis of circulatory anatomy. Selected chapters in the field of cancerous and infectious spread will serve to illustrate the relevant points.

EMISSARY VEINS AS PATHWAYS OF INFECTIONS

Among the pathways of infections, that have become of interest lately are the veins that connect the venous system outside the skull with the venous sinuses on the inside. There is a rich venous network in the face, the infratemporal region and around the pharynx which in some places assumes the configuration of venous plexuses such as the pharyngeal and pterygoid plexuses. These extracranial veins anastomose through foramina of the skull with the large venous channels that are formed by the dura, the dural venous sinuses. What is the function of these connecting or emissary veins as they have been called? They act as safety valves in case of increased intracranial pressure. The connection of the internal jugular vein which drains these venous sinuses, with the right heart is close enough so that pressure

changes in the thorax due to coughing sneezing straining muscular exertion, and forced expiration are readily transmitted to the internal jugular vein and through it to the dural sinuses. This would lead to an abnormal increase in intracranial pressure if it were not for the emissary veins acting as safety valves. We have to visualize in these veins a to and fro movement of the blood, the direction of which depends on the changing pressure conditions in the internal jugular vein. The sinuses and most of the facial veins are devoid of valves a factor which facilitates the reversal of the blood stream.

On the other hand the tortuosity of the lateral sinus and of the beginnings of the internal jugular vein as well as the meshwork of septa in some of the sinuses act as a check mechanism preventing too much suction on the sinuses in case of a rise in negative pressure in the large intrathoracic veins. These same factors are also responsible for a slowing of the blood flow in the sinuses which might account for the frequent occurrence of aseptic sinus thrombosis. But more dangerous than the sterile type is the septic thrombosis of the sinuses which is transmitted to them by way of the emissary veins. We know how readily infection of the lips and nasal area may lead to cavernous sinus thrombosis which before the advent of chemotherapy was almost invariably fatal. It is the easy reversibility of the venous blood flow in the absence of valves and the milking motion of the ever contracting muscles of facial expression around the veins that are responsible for the dislodgment of a septic thrombus and its passage into the dural sinus. Or an infectious thrombophlebitis in the labial veins may spread by continuity into the angular and ophthalmic veins and from there into the cavernous sinus leading to sinus thrombosis and meningitis or generalized sepsis. Infection of the orbit and of the frontal and ethmoidal paranasal sinuses

may travel the same path. Peritonallary infection may cause thrombophlebitis of the pharyngeal plexus and spread from there by way of emissary veins through foramina in the base of the skull likewise to the cavernous sinus. Erysipelas of the scalp may infect the superior longitudinal sinus through the parietal emissary vein. Most common is the involvement of the sigmoid sinus in mastoid infection which may spread to the sinus by way of a thrombophlebitis of the middle ear veins, by way of the lymphatics or by continuity directly from the infected mastoid bone (Braun). The emissary veins are also responsible for the fact that spread of infection from the dural sinuses into the general circulation cannot be prevented with certainty by ligation of the internal jugular vein, since the infection may pass the ligated vein by way of emissary veins in the region of the occiput which communicate with veins of the neck.

Attention has been called to an otitic hydrocephalus, complicating middle ear infection (Symonds, 1937). The condition characterized by bilateral papilledema and severe headaches, results from an increase in intracranial pressure which is brought about by an infection of the sigmoid sinus and by spread of this infection to the superior longitudinal sinus. It is not so much the thrombosis of this sinus, but rather the thrombophlebitis, i.e. the infection of the sinus, which interferes with the absorption of the spinal fluid through the arachnoid villi and leads to rise in intracranial pressure (Symonds, 1937). Symonds (1940) showed that infection in the neighborhood of the tonsils and in the nasopharynx may also lead to hydrocephalus by secondary involvement of the superior sagittal sinus. Thrombophlebitis of this sinus may then spread in retrograde direction into the superior cerebral veins which drain into this sinus and which supply the motor area of the brain. The results are cortical symptoms such as focal epilepsy and hemiplegia. Lately Martin has described a combination of increased intracranial pressure and focal signs of cortical involvement such as convulsions and hemiplegia occurring in the first weeks of the puerperium. The disease may lead to recovery or death. The interesting point is that these so-called

thromboses of the venous sinuses and cerebral veins are actually emboli that by a devious pathway have been transported to the brain from pelvic veins, by passing lungs and other organs. This newly described avenue will be dealt with in later parts of this paper. Here it may suffice to point out that there is an important anastomosis between the veins of the vertebral canal and the dural sinuses through the great occipital foramen.

LYMPHATIC SPREAD OF CANCER OF THE BREAST

Having presented a location which exemplifies the venous spread of infection it may be appropriate to turn to another mode of propagation namely the lymphatic pathway and select a malignancy for illustration. An ideal representative is cancer of the breast, because it is so easily accessible to surgery and anatomical study. It was this location of cancer for which Sampson Handley developed his theory that cancer spreads centrifugally in all directions from its point of origin by permeation i.e. continuous invasion of lymphatic plexuses. While Handley's theory of continuous lymphatic spread to distant points in the organism is too dogmatic and narrow since it disregards lymphatic embolism and venous propagation of cancers, it nevertheless placed the operative treatment of cancer on a rational, i.e. anatomical basis. It laid the scientific foundation for the radical surgical treatment of cancer of the breast which had been developed previously by Halsted on an empirical basis. Halsted's operation exemplified the fact that cancer can be cured even after it has spread from its primary focus to the regional lymph nodes, an experience which is borne out in other locations.

Since the pathways of metastatic spread of mammary cancer were discussed in detail in a previous paper (Lachman) only those facts shall be pointed out here that can be applied also to other areas where lymphatics are involved in the propagation of tumors. The principal lymphatic drainage of the breast passes from its subareolar plexus to the pectoral central, and apical nodes of the axilla, and from there with or without interposition of supraclavicular nodes into the thoracic duct on the left or the right lymphatic duct. But

deviations from this basic arrangement frequently occur, consisting in short-cuts which may by pass one two or even three of the relay stations mentioned. Thus direct lymph drainage from the breast into the central apical or supraclavicular set may occur. In the latter case we have the clinical picture of enlarged supraclavicular nodes without involvement of the axilla a condition which in general is regarded as inoperable.

Radical surgery with removal of the two pectoralis muscles is predicated on the presence of a direct lymphatic channel from the superior portions of the breast to the apical nodes through the substance or along the deep surface of these muscles. Pressure on nerves in the axilla by enlarged nodes and interference with the lymph drainage of the arm resulting in edema are interesting by products of axillary metastases which find their counterpart in nerve symptoms and edema in cancers of other regions.

Another clinically important point is illustrated in the opening up of atypical lymph channels after blockage of the usual lymphatic pathways. This is exemplified by occasional involvement of the inguinal lymph nodes in cancer of the breast. Of the greatest practical importance are pathways from the medial half of the breast to the other breast to the other axilla, and to the internal mammary nodes. Spread to these locations usually precludes surgical cure. The last named lymph nodes fortunately atrophy in older age thus eliminating this mode of cancer spread. The pleura and peritoneum are within reach of direct lymphatic involvement the pleura by communications with the lymphatics of the pectoral and intercostal muscles the peritoneum by way of lymphatics from the inferior and medial segment of the breast that anastomose through the linea alba with subperitoneal lymph plexuses.

PORTAL VEIN AND LYMPHATICS IN THE PROPAGATION OF TUMORS AND INFECTIONS OF THE GASTROINTESTINAL TRACT

So far we have presented avenues that illustrate the spread of infections in the venous system and of tumors through the lymphatic system. By contrast the portal circulation ex-

emplifies a pathway that is traveled by tumors and infections alike. It is one of the great natural highways along which infections and cancerous emboli may readily pass. Three unpaired arteries supply the gastrointestinal tract and its glands from the lower end of the esophagus to the upper portion of the rectum the celiac the superior and inferior mesenteric arteries. They ramify into smaller and smaller arteries and arterioles and finally break up into a capillary network in the wall of the intestines or within the glands. The blood then is collected by venules, which drain into larger and larger veins finally to form the splenic, the superior and inferior mesenteric veins. Their blood is poured into the portal vein which enters the liver and here forms another capillary system around the columns of liver cells. The portal vein thus drains an area in which infections as well as malignancies are very common. Among the infections appendicitis, ulcerations of the stomach duodenum and colon and diseases of the rectum such as proctitis and infected hemorrhoids deserve mention. It is particularly appendicitis which may lead to suppurative thrombophlebitis first of the tributaries of the portal vein and then of the portal vein itself. The incidence of portal thrombophlebitis in appendicitis varies according to Ochsner from 0.1 to 1 per cent of all cases. The pathway to the portal vein is by way of the appendiceal vein in the mesenterium of the appendix, the ileocecal vein and the superior mesenteric. Either by continuous growth of the septic thrombus along the venous channels into the liver or by detachment of a septic embolus from a thrombus in any of the veins mentioned single or multiple liver abscesses result. Septic embolism in the liver from a phlebitis in the appendiceal vein may occur without involvement of the intervening veins. Abscesses following appendicitis are usually multiple and are located in the right lobe of the liver. It has been pointed out, originally by French authors and later by others in this country, that the portal vein contains two currents of venous blood, one coming from the superior mesenteric vein and going to the right lobe of the liver, the other from the splenic and inferior mesenteric veins passing into the left

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LYMPHATIC SPREAD OF CANCER OF THE BREAST

Having presented a location which exemplifies the venous spread of infection it may be appropriate to turn to another mode of propagation namely the lymphatic pathway and select a malignancy for illustration. An ideal representative is cancer of the breast, because it is so easily accessible to surgery and anatomical study. It was this location of cancer for which Sampson Handley developed his theory that cancer spreads centrifugally in all directions from its point of origin by permeation i.e. continuous invasion of lymphatic plexuses. While Handley's theory of continuous lymphatic spread to distant points in the organism is too dogmatic and narrow since it disregards lymphatic embolism and venous propagation of cancers, it nevertheless placed the operative treatment of cancer on a rational i.e. anatomical basis. It laid the scientific foundation for the radical surgical treatment of cancer of the breast which had been developed previously by Halsted on an empirical basis. Halsted's operation exemplified the fact that cancer can be cured even after it has spread from its primary focus to the regional lymph nodes, an experience which is borne out in other locations.

Since the pathways of metastatic spread of mammary cancer were discussed in detail in a previous paper (Lachman) only those facts shall be pointed out here that can be applied also to other areas where lymphatics are involved in the propagation of tumors. The principal lymphatic drainage of the breast passes from its subareolar plexus to the pectoral central and apical nodes of the axilla, and from there with or without interposition of supraclavicular nodes into the thoracic duct on the left or the right lymphatic duct. But

deviations from this basic arrangement frequently occur consisting in short-cuts which may by pass one two or even three of the relay stations mentioned. Thus direct lymph drainage from the breast into the central apical or supraclavicular set may occur. In the latter case we have the clinical picture of enlarged supraclavicular nodes without involvement of the axilla, a condition which in general is regarded as inoperable.

Radical surgery with removal of the two pectoralis muscles is predicated on the presence of a direct lymphatic channel from the superior portions of the breast to the apical nodes through the substance or along the deep surface of these muscles. Pressure on nerves in the axilla by enlarged nodes and interference with the lymph drainage of the arm resulting in edema are interesting by products of axillary metastasis which find their counterpart in nerve symptoms and edema in cancers of other regions.

Another clinically important point is illustrated in the opening up of atypical lymph channels after blockage of the usual lymphatic pathways. This is exemplified by occasional involvement of the inguinal lymph nodes in cancer of the breast. Of the greatest practical importance are pathways from the medial half of the breast to the other breast to the other axilla, and to the internal mammary nodes. Spread to these locations usually precludes surgical cure. The last named lymph nodes fortunately atrophy in older age thus eliminating this mode of cancer spread. The pleura and peritoneum are within reach of direct lymphatic involvement the pleura by communications with the lymphatics of the pectoral and intercostal muscles, the peritoneum by way of lymphatics from the inferior and medial segment of the breast that anastomose through the linea alba with subperitoneal lymph plexuses.

PORTAL VEIN AND LYMPHATICS IN THE PROPAGATION OF TUMORS AND INFECTIONS OF THE GASTROINTESTINAL TRACT

So far we have presented avenues that illustrate the spread of infections in the venous system and of tumors through the lymphatic system. By contrast the portal circulation ex-

emplifies a pathway that is traveled by tumors and infections alike. It is one of the great natural highways along which infections and cancerous emboli may readily pass. Three unpaired arteries supply the gastrointestinal tract and its glands from the lower end of the esophagus to the upper portion of the rectum the celiac, the superior and inferior mesenteric arteries. They ramify into smaller and smaller arteries and arterioles and finally break up into a capillary network in the wall of the intestines or within the glands. The blood then is collected by venules which drain into larger and larger veins finally to form the splenic, the superior and inferior mesenteric veins. Their blood is poured into the portal vein which enters the liver and here forms another capillary system around the columns of liver cells. The portal vein thus drains an area in which infections as well as malignancies are very common. Among the infections appendicitis ulcerations of the stomach duodenum and colon and diseases of the rectum such as proctitis and infected hemorrhoids deserve mention. It is particularly appendicitis which may lead to suppurative thrombophlebitis, first of the tributaries of the portal vein and then of the portal vein itself. The incidence of portal thrombophlebitis in appendicitis varies according to Ochsner from 0.1 to 1 per cent of all cases. The pathway to the portal vein is by way of the appendiceal vein in the mesenteric lumen of the appendix, the ileocecal vein and the superior mesenteric. Either by continuous growth of the septic thrombus along the venous channels into the liver or by detachment of a septic embolus from a thrombus in any of the veins mentioned single or multiple liver abscesses result. Septic embolism in the liver from a phlebitis in the appendiceal vein may occur without involvement of the intervening veins. Abscesses following appendicitis are usually multiple and are located in the right lobe of the liver. It has been pointed out, originally by French authors and later by others in this country that the portal vein contains two currents of venous blood one coming from the superior mesenteric vein and going to the right lobe of the liver the other from the splenic and inferior mesenteric veins passing into the left

lobe so that abscesses and metastases of tumors would be located accordingly. In man there is definitely intermingling of blood so that too much reliance cannot be placed on this scheme.

Pyemic abscesses that are the result of appendiceal or intestinal infection may spread along intrahepatic vascular channels into the hepatic veins and from there by way of the inferior vena cava into the lungs and into the general circulation. In a recent clinical pathological conference reported in the *New England Journal of Medicine* a case was described in which following a postappendiceal abscess, pulmonary and hepatic abscesses occurred. The discussant postulated that the recal abscess must have led to septic thrombosis of the iliac vein and embolism from there into the lung overlooking the fact that liver abscesses may readily spread into the lung following the natural venous drainage and that the introduction of an additional source of the septic pulmonary embolism was unnecessary. Surprisingly enough and anatomically without foundation, after the occurrence of the emboli in the lung and the diagnosis of the liver abscesses a ligation of the superficial femoral vein was done which of course was of no avail. Ligation of the tributaries of the portal vein particularly of the ileocolic vein in the presence of thrombosis, have been suggested in the literature but modern chemotherapy is the method of choice.

In passing the other modes of infection of the liver should be mentioned, since the liver is an ideal example for the multiplicity of sources of infectious spread. In addition to the portal vein which is the main channel for the transmission of septic emboli, the hepatic artery is frequently responsible for the settling of infections in the liver following infections of the general circulation such as osteomyelitis, endocarditis, carbuncles, respiratory infections, and pyemias from any source. A third source is direct ascending infection along the bile passages, also infections from the neighborhood such as paraneuritic and perinephritic abscesses. Occasionally lymphatic from the appendix and gall bladder may transmit infections and finally a retrograde spread from the head by way of the superior vena

cava, right heart, inferior vena cava, and hepatic veins has been reported.

Coming to the propagation of cancers to the liver we have the same organs of the gastrointestinal tract as sources of embolic spread and the same pathways, foremost among them the portal vein. Tumors concerned are, among others, cancers of the stomach, intestines including the rectum, and pancreas. There is an increasing tendency on the part of pathologists to regard cancerous spread by way of the blood stream as important as lymphatic propagation. Such an experienced observer as Miles who has pioneered the radical operation of rectal cancer has been proved wrong when he stated that for practical purposes we can disregard the occurrence of portal spread to the liver. We know now how common blood-borne metastasis is in cancer of the rectum. Often several generations of metastases may be found in the liver the first one being a localized metastasis brought to the liver by the portal vein which secondarily has led to show

ers of daughter metastases around it (Wills). It has been said that intravascular invasion, i.e. invasion of the portal territory occurs in 1/3 of all cancers of the lower colon and rectum. The higher the grade of malignancy the higher the incidence of venous involvement and the greater the chances of metastasis to the liver and from there to other organs. It seems that the vascular invasion is most apt to occur within the intestinal wall itself or within the perirectal tissue rather than at a distance. Thus early cancers may penetrate into the veins before they become locally inoperable (Glover and Waugh). The intravascular malignant thrombus encountered at necropsy or at operation is often found lying free within the lumen of the vessel and the ease with which it can become detached is very apparent (Dukes and Bussey). This represents a warning against rough handling of the tumor and rectum before vessels are ligated.

Evidence of tumorous growth within the hemorrhoidal veins is no absolute proof that the case is hopeless. But it is an indication that hematogenous spread is impending. Continuous or embolic spread of the malignant condition is an unpredictable event about

in the inguinopectineal region still prevails to a greater extent than we are prone to admit. Any doubt as to the validity of this statement can be resolved by interviewing our colleagues and junior surgeons. From Cooper's book it is not possible to obtain a clear understanding of this ligamentous structure. Seelig and Tuholske in their quest for more meticulous anatomical information on this ligament consulted, in addition to American and English texts many French and German anatomies. Surprisingly their investigation revealed that anatomists are not in complete agreement on what fascial structures conjoin to form Cooper's ligament. Moreover the anatomical drawings of this ligament are too frequently stereotyped and often devoid of structural correlation. Naturally with this paucity of knowledge and with scarcely any available references, there has been reluctance to adopt the use of Cooper's ligament especially when so much complacency exists as regards the results following repair with the inguinal ligament. Recently however Anson and McVay through anatomical research of the inguinal region, have contributed much toward clarifying our knowledge of Cooper's ligament. Their contributions have also enhanced our understanding of the relationship and continuity of the musculoaponeurotic strata of the inguinohypogastric region. Similarly they have traced the destiny of the enveloping fasciae of the parietal strata comprising the wall of the inguinal canal.

2 The multiplicity of names by which this ligament is identified—Cooper's, pectineal, iliopectineal pubic and superior pubic ligament—superimposes further confusion. In conformity to the early custom an anatomical structure was named after its discoverer. In this instance, Cooper not only was the discoverer of the ligament which bears his name, but he possessed the exceptional foresight of predicting its clinical application in the treatment of femoral hernia. While we do not wish to detract from Cooper's noteworthy achievements, in the interest of clarity it would be better that all proper names give way to anatomical nomenclature. The older literature leaned toward the terms 'pectineal' and 'iliopectineal', but the modern writers have developed a predilection for 'superior pubic' and 'pubic'. The latter tend to emphasize the entire underlying bone structure, the superior pubic ramus, while the former are more specific since they refer to an undisputed and universally recognized anatomical line of the ramus, the iliopectineal line or pecten. This line extends from the eminentia iliopectinea or iliopectineal junction to the pubic tubercle. Therefore, in a strictly anatomical sense

it would seem that iliopectineal is the preferable term for this ligament. It is realized that the Basle Nomina Anatomica has classified this ligament as the superior pubic.

3 The false complacency of surgeons concerning the results of the femoral, subinguinal, or inferior approach offered little incentive to developing other possible maneuvers in the hope of finding a better technique for the repair of femoral hernia. It was not realized that total extirpation of the peritoneal sac by this route is impossible. Actually only the excision of the subligamentous portion of the sac is possible and the surgeon is limited to a simple repair of the pectineal fascia. Both of these features are currently conceded as inadequate in our present concept of hernia repair. Furthermore in using the inferior approach the surgeon fails to take into consideration the genesis of femoral hernia, which is not infrequently a manifestation of a coexisting polylocular inguinal hernia. Consequently it is not possible to recognize, evaluate, or correct the composite saccular or coexisting mural deficiency of the inguinal region by the femoral route. In retrospect, the perpetuation of the latter technique has been based upon invalid premises and a misconception of its results. Incidentally this erroneous operative approach has retarded wider adoption of the superior or inguinal approach in the treatment of femoral hernia.

4 Possibly the most important deterrent to the acceptance of the Cooper's ligament technique has been the potential technical difficulties encountered because the ligament is deeply placed and the juxtaposition of the external iliac vessels creates the exaggerated fear of inadvertently puncturing them. The obturator vessels, if present, should be ligated for the occasional tearing of these vessels in the exposure of the pubic ramus will probably cause the surgeon more concern than the possibility of puncture of the iliofemoral vessels. By routine ligation of the inferior epigastric vessels, better exposure of Cooper's ligament is obtained, and in our experience we have encountered no complications attributable to this procedure. The placement of the most lateral sutures in Cooper's ligament may be slightly more hazardous than in the inguinal ligament for the surgeon who is undisciplined in hernial technique and not thoroughly familiar with the anatomy of this region. However these obstacles are mainly mental hazards which vanish with surgical experience and training.

5 The classification of inguinal hernia as given in most texts is misleading. For instance, the junior surgeon is taught that femoral hernia is a

which very little can be done except resort to surgery at the earliest possible moment. It is the spread to the regional lymphatics that determines the scope and technique of the operation. The anatomical investigations of Miles on the lymphatic propagation of rectal cancer have determined the radical surgical approach in the same way as the anatomical studies of Halsted and Handley have done for cancer of the breast. The principles of lymphatic spread are the same in the two conditions. Phenomena such as the by passing of lymph nodes by cancerous emboli or the reversal of the lymph stream in the presence of lymphatic obstruction with atypical involvement of nodes occur also in rectal cancer. The details of lymphatic drainage of the rectum and the mode of lymphatic spread of rectal cancer cannot be discussed here. But it is interesting to note that recently a reinvestigation of the lymph drainage of the highest portion of the rectum has been undertaken (Glover and Waugh). Based on the fact that the lymph stream from this part goes mainly upward along the superior hemorrhoidal vein the proposition has been put forth to restrict the extent of rectal resection in cancer of the upper portion and to preserve the sphincteric apparatus. Without wanting to enter into a discussion of the merits of the problem the anatomist is of course gratified to see that the pros and cons of the argument are offered on the basis of a study of the lymphatic anatomy of the region.

THE ANATOMICAL PRINCIPLES OF METASTATIC SPREAD

Having discussed some of the representative venous and lymphatic channels along which infections and tumors travel, it seems worth while to take up the subject of metastatic distribution from a more general angle and to dwell on the principles of tumor spread. Once a tumor has invaded the venous or lymphatic circulation, there exists the ever present danger of tumor particles becoming dislodged. After this has taken place the tumorous emboli are a cellular component of the blood or lymph stream and as such are transported wherever the current leads them. Their flow will be arrested at a site that depends on the

relative dimensions of vascular tube on the one hand and embolus on the other. Thus a metastatic embolus traveling in the general arterial stream reaches the smaller arterioles and is finally caught in the capillary network if the embolus is of sufficient size i.e. if it consists of more than a few cells. Somewhat more complex is the pathway through the liver. Two vascular channels the portal vein and the hepatic artery feed the capillary system of the liver and both are potential sources of metastatic emboli. Only one venous system the hepatic veins, drains this organ. Still more intricate is the arrangement in the lung. Here the pulmonary artery transmits venous blood which after oxygenation in the pulmonary capillaries is collected in the pulmonary veins and brought to the left heart and from there into the general arterial circulation. In addition the bronchial arteries and veins form their own capillary network in the wall of the bronchi. The two systems anastomose freely. Most metastatic emboli are transported to the lungs by way of the pulmonary artery and are arrested in the capillary system of the lung. Here they may or may not take root. If they do they may eventually break into the veins of the pulmonary or more rarely of the bronchial system. In the former case the emboli are transported into the general circulation in the latter they are returned to the lungs by way of the azygos or innominate veins superior vena cava, right heart, and pulmonary artery. Thus a new crop of pulmonary metastases may be set up as a result of this spread. Few emboli may also be brought to the lungs by way of the bronchial arteries from the general arterial circulation.

Figure 1 illustrates the capillary networks in a basic scheme of the circulation which has been developed by Walther. *a* is the capillary system of the lung the upper part of the ellipse represents the arterial side the lower part the venous side of the circulation. An embolus that enters the general circulation may be arrested in its capillary system (*c*) which is exemplified by the capillaries of the bone marrow the brain the skin the kidney or any organ that drains directly into the caval system. In the case of a lung tumor that has invaded the pulmonary veins, the sys-

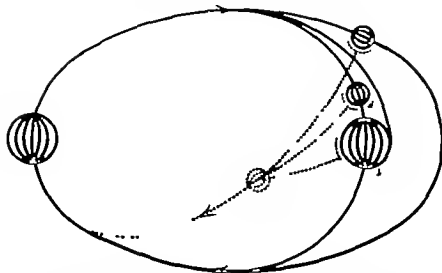


Fig. Basic scheme of circulation. Heavy lines represent blood vessels containing arterial blood, double lines depict vessels containing venous blood, dotted lines lymphatics. *a*, Lung. *b*, Liver. *c*, Organs drained by venae cavae. *d*, Organs drained by portal vein. *e*, Regional lymph nodes. (Modified from Walther.)

temic capillary system is the first capillary filter which the embolus encounters. In contrast to this, an embolus that is dislodged from a cancerous thrombus in a peripheral vein is arrested in the capillary network of the lung (*a*). The systemic capillary network (*c*) then is the second filter for this tumor. *d* represents the capillary system of any organ that drains into the liver by way of the portal vein such as the stomach, intestines, pancreas, and spleen. *b* is the portal capillary system of the liver. A tumor of the gastrointestinal tract that breaks into a vein, spreads to the liver and from there to the lung. The lung is therefore the second filter for this tumor and the peripheral capillary network the third. We also see that tumor emboli traveling in the general circulation may be brought directly to the liver by way of the hepatic artery. This is demonstrated by the arc to the right of *d*. We further notice in this diagram the lymphatic drainage represented as coming from *b*, *c*, and *d* terminating in the venous circulation by way of the thoracic duct. *e* represents the system of interposed regional lymph nodes. Thus a tumor arising in the gastrointestinal tract may by pass the liver without metastasizing there and spread to the lungs via the lymphatics, the thoracic duct, superior vena cava, right heart, and pulmonary arteries.

According to this basic scheme there are then three or four types of metastatic spread (Walther) (1) The lung type whereby a tumor arising in the lung may break into the pulmonary vein and spread from there into the general arterial circulation (Fig. 2a). In this case the metastatic embolus could be arrested anywhere in the capillary bed of the periphery be it the skin, the bone marrow, the kidney, the liver or the brain. (2) The liver type (Fig. 2b). To this group belong the rare primary tumors of the liver for whom the first filter is the lung. (3) The vena cava type (the previous group is just a subheading of this group) (Fig. 3a) represented by all tumors that potentially break into and spread in the general venous circulation, i.e. most tumors, particularly those of the skin and its appendages—melanomas and breast cancers, tumors of the nervous system, nasopharynx, upper esophagus, lower rectum and anus, thyroid bones, and urogenital system. (4) The portal type (Fig. 3b) in which a tumor metastasizes to the liver by way of the portal vein then via hepatic veins, inferior vena cava, right heart, and pulmonary arteries to the lungs where a break through into the pulmonary veins leads to spread into the general circulation. The shunt around the liver directly to the lung via the lymphatics likewise occurs.

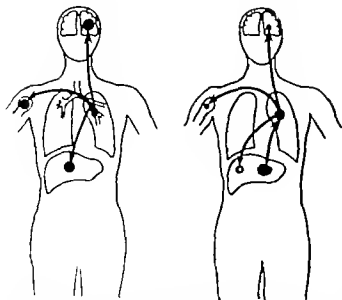


Fig. 2. Types of metastatic spread. a, left, Lung type. Tumor arising in the lung spreads after invasion of pulmonary vein, into general arterial circulation exemplified here by bone marrow, brain, and liver. b, Liver type. Primary tumor of liver spreads first to lung and from there as in a. (From Walthers)

To see this scheme in its proper perspective one has to realize the importance and frequency of venous spread of cancer. According to Willis, it amounts to 50 per cent of all fatal cases. Once a metastasis has been set in any of the organs, it behaves like a primary tumor as far as the direction of its spread is concerned. It may easily break into a vein and set up a second generation of metastases. Thus different series of metastases may be superimposed and complicate the analysis (Willis).

An understanding of the pathways of lymphatic spread is somewhat complicated by the fact that once a lymph node is invaded it may be blocked and a collateral lymph flow may be opened up with reversal of the lymph current and involvement of atypical nodes (Taylor and Nathanson). Atypical nodes may also become cancerous by a rather devious route namely as a result of lymphatic spread from an organ that has become secondarily involved by way of the blood stream. Conversely metastatic cancer of the lymph nodes is apt to invade adjacent veins wherever these are in close proximity as e.g. in the neck, in the axilla, in the mediastinum, and in the pelvis.

Since we must assume from microscopic evidence at hand that many tumor emboli are considerably larger than the diameter of the

capillaries we can postulate that such emboli are arrested in the first capillary network they encounter. Consequently it is not surprising that the commonest sites of metastatic involvement are the liver and lungs since for most tumors these organs represent the first and second capillary filters encountered.

Taking into account all anatomical facts listed we generally have no difficulty to explain the pathway which a certain metastasis has taken. The difficulty usually arises in accounting for the noninvolvement of certain organs. Thus the lung occasionally escapes in cancer that has metastasized into the general circulation. Particularly in cancer of the breast and prostate do we sometimes find an isolated metastasis in the body far away from the primary focus yet without involvement of the lungs a fact which is not compatible with our scheme. Many theories have been offered to explain the abnormal location of metastases (Willis). Only a few shall be discussed here: (a) Paradoxical or crossed embolism. An open foramen ovale is supposed to explain the passage of tumor emboli from the systemic veins

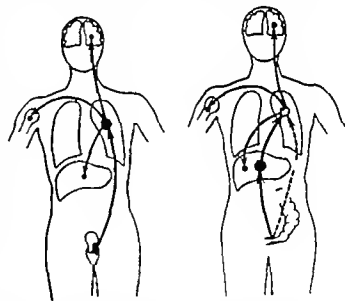


Fig. 3. Types of metastatic spread, continued. a, left, Vena cava type, represented by all tumors that invade the general venous circulation and exemplified here by tumor of the uterus. First filter is the lung. Spread from there by way of general arterial circulation as in 2 a. b, Portal type, represented by all tumors that invade portal circulation and exemplified here by tumor of the upper rectum. First filter is the liver. Spread from there to lung, and then as in 2 a. Shunt around liver by way of lymphatics, thoracic duct, and venous circulation is shown by interrupted line. (From Walthers)

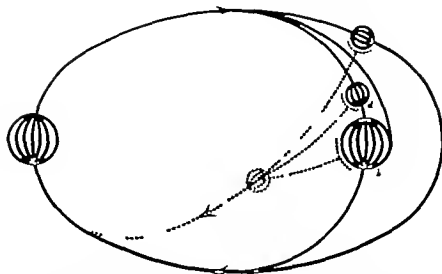


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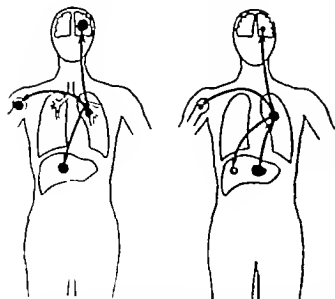


Fig. 2 Types of metastatic spread. a, left Lung type. Tumor arising in the lung spreads, after invasion of pulmonary vein, into general arterial circulation exemplified here by bone marrow, brain and liver. b Liver type. Primary tumor of liver spreads first to lung and from there as in a. (From Walther)

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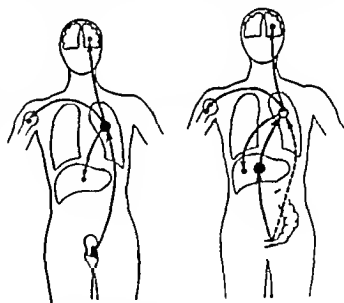


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directly into the arterial circulation by passing the lungs. This must be very rare since a functionally patent foramen ovale is a rather infrequent occurrence. (b) Retrograde venous embolism. Reversal of the blood flow in case of venous obstruction by a cancer may explain the presence of ovarian, vaginal, and epididymal metastasis in case of renal tumor. (c) The noninvolvement of the lungs in case of systemic metastasis has been explained on the basis of the passage of individual tumor cells through the pulmonary capillaries without arrest. While this may occur probably the breaking off of clusters of tumor cells larger in diameter than the cross section of the pulmonary capillaries is more common. But it has to be realized that gross anatomical evidence of the absence of tumor tissue in the lungs does not prove noninvolvement of the lungs. In many cases careful microscopic search will reveal the presence of small emboli in the pulmonary arterioles.

THE VERTEBRAL VENOUS PLEXUS AND ITS SHARE IN THE SPREAD OF TUMORS AND INFECTIONS

In recent years experimental and clinical proof has been offered for a pathway we were hardly aware of but which removes many of the difficulties that are encountered in explaining the spread of metastasis and infection (Batson). As stated before, it is particularly the isolated involvement of the skeleton in metastatic spread of cancer of the breast and prostate which has baffled observers. How can metastatic emboli from the prostate reach the spinal column without being arrested in the lungs? In answer to this question Batson called attention to a large venous system within and outside the spinal canal extending from the head to the sacrum which had been described a century ago by the Frenchman, Breschet, and by German authors, but had since been forgotten (quoted from Harris). As these authors showed there is a rich plexus of segmental veins on the outside of the spinal column anteriorly and posteriorly as well as inside the spinal canal. These veins also surround the spinal nerves within the intervertebral foramina and thus act as a cushion for the spinal nerves and the spinal cord. Another

characteristic feature is the rich anastomoses of these veins, particularly in a longitudinal direction but also the cross communications between right and left and from the inside of the canal to the outside. These veins are valveless and anastomose above with the cranial venous sinuses and below with the hypogastric veins.

In his experiments on human cadavers and later on live rhesus monkeys, Batson injected the dorsal vein of the penis with dyes and opaque media and found that the dye in addition to going to the inferior vena cava also entered the spinal veins and the vertebral plexus depending on the position of the body and on the viscosity and amount of material injected. After injection of 200 cubic centimeters of a thin mass the contrast medium did not fill the vena cava but went along the vertebral veins to the skull. Repeated injections confirmed this and demonstrated filling of the venous sinuses of the cranial cavity. In the live monkey after injection of thorotrast into the dorsal vein of the penis, filling of the caval system by way of the hypogastric and common iliac veins was noticed. Imitating the changed pressure conditions that take place in straining coughing sneezing a towel was tied around the abdomen of the animal with the result that the contrast medium entered the vertebral veins. Injection into a venule of the breast of female cadavers led to extensive filling of vertebral veins and sinuses of the skull by way of the intercostal veins. The veins of the shoulder girdle and the vasa vasorum down to the elbow were likewise demonstrated.

Thus we have to regard the vertebral venous system as a plexus which contains a considerable amount of blood, more than is necessary for drainage of the organs it surrounds. It acts as a reservoir a function which is facilitated by the absence of valves, by the rich anastomoses with other body veins and by its plexiform arrangement. We have to assume that the blood flow in this system is easily reversed following changing pressure conditions such as take place in straining. Batson's experiments demonstrate how freely the blood of the prostatic plexus and of the veins of the breast enters the vertebral plexus by-passing the systemic, pulmonary and

portal circulation. This then is undoubtedly the pathway that is taken by cancerous emboli from the prostate to the pelvis and spinal column. It is in all probability also the channel used in the spread of carcinoma of the breast to the skeleton. Work by other investigators (Collis) has confirmed a path from the lung and pleura by way of the bronchial and intercostal veins and vertebral veins to the brain thus explaining the frequent occurrence of brain abscess in pulmonary infections and empyema, and metastasis to the skull and brain in pulmonary cancer. We now also understand the involvement of the cranial venous sinuses in puerperal fever which was mentioned in the beginning (Martin).

The recent investigations on the vertebral venous system have cleared up many of the difficulties in understanding the distribution pattern of cancerous and infectious emboli.

Having discussed the highways and byways along which metastatic spread takes place one basic fact still needs to be pointed out: mechanical arrest of a tumor embolus is not identical with transformation of this embolus into a florid metastasis. Many emboli apparently never take. We have to assume that tumor particles of sufficient size, once they have reached the general circulation are deposited indiscriminately anywhere where the blood stream leads them and that their arrest is determined only by the relative size of the embolus and the capillaries it traverses. Why then we must ask ourselves are metastases so rare in certain locations such as skeletal muscles, the heart, spleen, the wall of the intestine all of which have such a rich blood supply? And why is metastasis so common in other locations? Mechanical factors and reasons of vascular anatomy are insufficient to

furnish an explanation although it has been attempted on this basis. Tissue susceptibility on one hand and general and local resistance on the other must be instrumental in determining the selection of metastatic sites. Experimental evidence on tissue cultures point to chemical factors such as oxygen tension, hydrogen ion concentration, and the accessibility of growth promoting hormones in the tissues as being responsible for the distribution of metastases (Willis). Recognizing that he has done his share once the roads of metastatic spread have been clarified, the anatomist leaves these problems to the biochemist and the cancer pathologist.

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(52.5 per cent) of the 200 jaundiced cases, common duct stones were not found at operation. One hundred eighty six cases had proved common duct stones but almost one half (89 or 47.8 per cent) of these patients with common duct stones did not have jaundice. Painless jaundice occurred in 2 patients with common duct stones.

From these figures it appears that jaundice indicates common duct stones in only 50 per cent of the cases. In the other 50 per cent, the jaundice was the result of an associated hepatitis or cholangitis. The presence or absence of jaundice is an important but a treacherous sign. Fifty per cent of patients who have common duct stones do not have jaundice and in only 50 per cent of patients with jaundice have common duct stones been discovered.

The physical findings depended usually on the extent of the pathologic process. There was considerable spasm and rigidity over the right upper part of the abdomen in acute dislocation of the gall bladder. In a few instances a diagnosis of acute cholecystitis was made on the basis of physical findings and chronic gall bladder disease was found at operation and vice versa. Empyema of the gall bladder has been found when chronic cholelithiasis was expected.

ROENTGENOLOGIC EXAMINATION

Either oral or intravenous cholecystographic examination of the gall bladder was made in 910 of the 1,104 cases (82.4 per cent). One hundred ninety four patients had no roentgenologic examination. The cases not examined included those in which gallstones were an incidental finding, many who had secondary biliary tract operations and some with jaundice in which it was not thought of value to give the dye.

A correct diagnosis was made in 888 of the 910 patients (97.6 per cent) examined roentgenologically. In 559 cases (61.4 per cent) the gall bladder dye, in 197 cases (21.6 per cent) a diagnosis of nonfunctioning gall bladder was made and in all of these cases stones were found at operation. In 25 cases (2.7 per cent) a diagnosis of nonfunctioning gall bladder was made and no stones were found at

laparotomy, but 19 of these cases had microscopically proved chronic cholecystitis. Many of these were of the cholesterosis or strawberry group. The roentgenologic diagnosis of common duct stone was made and proved at operation in only 2 cases.

Right-sided renal calculi plus gallstones occurred in 2 patients and the renal stones were later proved to be present by retrograde pyelograms. A diagnosis of situs transversus was made in 2 cases and cholecystectomy was done through a left upper rectus incision. Pancreatic lithiasis was suspected once and proved by subsequent operation.

A diagnosis of irritable bowel or functional indigestion associated with gall bladder disease was made in 132 patients (12 per cent) of the total number of the 1,104 patients. These patients were all treated before and after the gall bladder operation for this condition.

Roentgenologic studies were misleading or erroneous in 22 (2.4 per cent) of the 910 patients examined. Twelve patients had normal cholecystograms, 5 of these had stones at operation and the remaining 7 had chronic cholecystitis. In 8 cases the cholecystogram was interpreted as showing cholelithiasis but no stones were found at operation. A diagnosis of nonfunctioning gall bladder was made in 1 case in which a normal gall bladder was found at laparotomy. An x-ray diagnosis of papilloma of the gall bladder was made in 1 case but not found at operation.

Because of the generally poor results from cholecystectomy for noncalculous cholecystitis before a surgical procedure is proposed in cases of faulty visualization of the gall bladder without demonstrable stones, certain criteria must be met (34, 49): (1) all other likely causes for the symptoms have been eliminated; (2) there is sufficient pain to warrant an attempt at relief by cholecystectomy; (3) a cholecystogram is abnormal on at least two tests.

Medical treatment of suspected or confirmed coexisting digestive disturbances has failed to relieve the symptoms.

PREVIOUS SURGERY

One hundred fourteen patients (10.3 per cent) had had previous biliary tract surgery.

distinct entity apart from inguinal hernia. In reality a femoral hernia is simply a variant of the peritoneal sac in which a locule makes its exit through a patent femoral ring. There is no embryonal basis for assuming that the femoral locule arises from a preformed peritoneal vestige as obtains in indirect hernia. McClure and Falls found in a series of 90 femoral hernias that 22.3 per cent of the patients had undergone repair of inguinal hernia previously. Such a high incidence of femoral locules in recurrent inguinal hernias points convincingly to the probability that femoral locules are frequently not diligently searched for and consequently overlooked at the time of the initial repair. Similarly Burton and Ramos in an analysis of 131 recurrent hernias found a much higher incidence of coexisting locules than were encountered in primary hernias. In this series there was an incidence of 13.8 per cent of diverticular locules as compared to 2.6 per cent in 2,302 primary hernias. Such a wide discrepancy of diverticular locules in recurrent and primary hernias strikingly illustrates the necessity of thorough digital exploration of the peritoneal sac for coexisting variants. These statistical data should be convincing evidence of the rationale of the inguinal route in the treatment of the femoral variant hernias. The contention that the femoral variant cannot be delivered from the superior approach is not valid. In our series of 100 repairs with Cooper's ligament no modification of the usual oblique skin incision of the inguinal region was necessary. In those femoral hernias which are incarcerated or strangulated the imprisoned bowel can be examined before it disappears into the abdomen. This is another advantage of the inguinal over the femoral route. In rare instances the lateral margin of the lacunar ligament may require sectioning to facilitate reduction.

6. Another important contributing factor which is retarding the acceptance of repair with Cooper's ligament is the failure to establish definite criteria for its employment. Most articles on the radical treatment of hernia have dealt almost exclusively with the technical phase of the operation and have omitted any discussion of the indications for the particular technical procedure. With emphasis on the criteria for the respective operative techniques, there is greater likelihood that the selected repair will be more physiological, more rational, and ultimately more successful.

CRITERIA FOR THE EMPLOYMENT OF COOPER'S LIGAMENT

1. Femoral loculation of the sac.
2. Insufficiency of the inguinal ligament.

3. Marked laxity of the parietal strata.
4. Arborization of the sac.
5. Multiple interfascicular defects with fascial incompetency.

For an operation to be successful recognition of its indications is just as essential as correct execution of the various maneuvers of its technique. Progress in surgery depends not only on the increasingly efficient application of advanced knowledge and techniques but also on the constant acquisition of new information. The failure to establish and to define clearly the criteria for the major phases of hernial operations, namely herniotomy, herniorrhaphy and hernioplasty is perhaps the most important factor contributing to existing confusion regarding the practical application of the fundamental principles underlying the numerous hernial operations. A common denominator embodying certain limitations in which the less experienced can safely follow should be available. The general acceptance of such a concept would promote standardization of the techniques and aid in comparative statistical studies. Therefore the criteria as proposed for the employment of Cooper's ligament are only intended to serve as a guide, allowing, of course, the judgment and experience of the surgeon.

1. *Femoral loculation of the sac.* All inguinal hernias have a peritoneal sac. The sac may have one or more outpocketings or locules. It is the anatomical location of the initial exit of the locule and/or locules that determines the type of hernia. For instance, if a locule of the sac protrudes through the femoral ring into the canal it is known as a femoral hernia. Actually it is simply one variant of the sac. There may be other coexisting locules. Unfortunately most textbooks of surgery and many articles in the current surgical journals classify femoral hernia as a separate entity distinct from inguinal hernia. The responsibility for this erroneous conception and in a large measure for its irrational treatment is traceable to the

The total excision of the sac inclusive of its locules is the first prerequisite to the cure of any hernia. This dictum of Bassini and Halsted (16) is equally true today. In small indirect hernias with no coexisting mural weakness, this maneuver will suffice. However in the presence of other variants of the sac or concomitant parietal defects, additive reinforcement of the wall is imperative. Therefore, with our present knowledge of the mural and sacular embryogeneses of hernia, it logically follows that any technique which does not completely expose the structures of the inguinal canal and

tomy was done and in only 2 of the cases was it found necessary to repair the hernia.

Cholelithiasis was also found in conjunction with ulcerative colitis, regional ileitis, sigmoid diverticulitis and rheumatoid arthritis. A cholecystectomy was done in an attempt to relieve the symptoms in these conditions.

No attempt was made in this series to tabulate the correlation between heart disease and cholelithiasis. Hurxthal and Dolgin have recently reviewed 559 cases of proved cholecystitis and cholelithiasis and found that 53 patients (9.5 per cent) had associated heart disease. Their impression is that the incidence of heart disease is not any higher in patients with gall bladder disease than it is in any other group of patients of the same age or sex distribution. They state that cholelithiasis may be responsible for varied electrocardiographic changes, but they do not believe that cholecystectomy will have any effect on the heart disease itself other than to eliminate the electrocardiographic findings caused by the cholelithiasis. Distinction between acute gall bladder disease and heart disease is at times difficult but usually by careful study the differential diagnosis can be made.

TUMORS OF THE GALL BLADDER

Tumors of the gall bladder are not common. Only 4 tumors were found in 1,036 cholecystectomies as follows: 1 benign papilloma, 1 malignant adenoma, and 2 adenocarcinomas. The incidence of carcinoma in this series is only 0.3 per cent. This is much lower than in a previously reported series (41) and a series by Vadheim Gray and Dockerty. In 3 of the 4 cases a diagnosis of cholelithiasis was made from the roentgenogram and the fourth patient who had a benign papilloma was operated on for acute cholecystitis. All 4 of these patients were operated on and all had gall stones. The incidence of gallstones with carcinoma in this series was 100 per cent while others (5, 22, 29, 36, 37, 42) report an incidence of 76 to 87 per cent. When the diagnosis is made preoperatively the lesion is usually too extensive for any chance of cure. Cases correctly diagnosed preoperatively as carcinoma of the gall bladder are not included in this report.

COMMON AND HEPATIC DUCT STONES

The philosophy of our surgical staff in regard to exploration of the common bile duct has been stated and restated (8, 9, 12, 30, 35). The present study corroborates our previous experiences (9) that there is no certain way to tell whether or not common duct stones are present. Suggestive points are often found in the history, physical examination, and at operation which lead one to believe that common duct stones are present or absent. Neither the mortality nor the morbidity is appreciably increased with common duct exploration, especially with the anesthesia (43) and preoperative preparation (1) employed at the present time. We believe therefore, that the common duct should be explored for any of the following indications: (1) frequent acute attacks of biliary colic, chills or fever; (2) past or present history of obstructive jaundice or laboratory signs thereof; (3) dilated or thickened common duct; (4) multiple small stones in the gall bladder; (5) unsatisfactory or suspicious findings on palpation; (6) sediment in aspirated bile from the common duct; (7) non-calculous gall bladder with biliary tract symptoms; (8) small contracted gall bladder; (9) acute or subacute pancreatitis or hepatitis.

The common duct was explored in 504 cases (45.7 per cent) and stones were found in 186 cases (16.8 per cent), 36.9 per cent of the ducts explored contained stones. There were 161 cases of cholelithiasis and common duct stones, 17 cases of common duct stones after previous cholecystectomy (done elsewhere) and 4 each of common duct stones with cystic duct remnant and with fibrosis of the sphincter of Oddi.

Occasionally one will find a dilated common duct and ampulla associated with cholelithiasis but no common duct stones. In these cases there usually are other indications for cholecystectomy besides dilatation of the duct. We believe the recent passage of a common duct stone is frequently the explanation of such a finding. Also patients may give a typical history of recurrent common duct stones and exploration will yield negative results. This occurred 6 times in this series.

Foreign bodies in addition to stones in the common duct are rare. Manson, Bahr and

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Walton reported the removal of a liver fluke from the common duct and Crawford reported an autopsy in which the blade of a hemostat was found in the common duct 7 years after a cholecystectomy. Removal of a broken T tube relieved recurrent obstruction in the common duct in 1 case in this series.

PANCREATITIS AND BILIARY TRACT DISEASE

Pancreatitis was found to be associated with biliary tract disease in 26 cases (2.35 per cent). The etiology of pancreatitis is quite generally considered to be the reflux of bile or pancreatic juice into the pancreatic duct caused either by a stone impacted in the ampulla of Vater or by anatomical variations in which both the duct of Wirsung and common bile duct open into the ampulla (47). In this type of relationship any spasm of the sphincter of Oddi may cause a diversion of the biliary flow. Also in certain instances there may be a hyperplasia of the epithelium of the pancreatic duct with an obstruction to the flow of pancreatic fluid, resulting in varying degrees of pancreatitis (47).

It has been our experience in the past (8, 22, 31) that direct surgery on the pancreas itself is rarely indicated. We do not believe that it is wise to incise or drain the pancreas. We consider pancreatitis to be a complication of disease of the biliary tract and therefore we usually drain the common bile duct and remove the gall bladder if indicated (33).

A diagnosis of interstitial pancreatitis or chronic pancreatitis is rarely made preoperatively and when found is merely more evidence for cholecystectomy. Patients with acute hemorrhagic pancreatitis are rarely operated upon in the acute stage as early surgery in these cases carries a very high mortality risk. When acute cholecystitis occurs in conjunction with acute interstitial pancreatitis, the diagnosis may be difficult and delay in surgery may be fatal.

In this series pancreatitis was found with cholelithiasis and a normal common duct in 8 cases and with chronic cholecystitis and a normal common duct in 5 cases. Chronic pancreatitis was found together with stricture of the common duct in 1 case similar to those cases reported by Peterson and Cole.

INTERNAL BILIARY FISTULA

An internal biliary fistula occurs more commonly than is generally thought. There were 16 cases in this series. They may be classified into two groups as spontaneous, and as those caused by a previous surgical procedure.

Spontaneous biliary fistula has been adequately reported by others (17, 50). This condition is rarely considered as a preoperative diagnosis unless there has been a history of passage of gallstones by rectum, or an intestinal obstruction caused by an impacted gallstone (40). Also a severe attack of biliary colic is sometimes followed by a period during which the patient is free of symptoms. This sequence is suggestive of a spontaneous fistula, especially if the patient has a long preceding history of disease of the biliary tract. If there is air in the biliary tree or if barium is seen in the biliary system during gastrointestinal examination this is presumptive evidence of an internal fistula.

A previous surgical procedure was the cause of a biliary fistula in 4 of our cases. Two patients had had a cholecystectomy and two others a choledochoduodenostomy. Ten of the patients with a spontaneous fistula had connections between the gall bladder and duodenum, 1 between the gall bladder and colon and 1 between the gall bladder and common duct.

It is advisable to close the fistula at the time of cholecystectomy otherwise complications may arise such as ascending cholangitis, which occurred in 2 cases in this series.

BENIGN STRICTURES OF THE BILE DUCT

Benign strictures of the bile duct comprise but a small group (23 cases) in this series and are mentioned only because a diagnosis was made of associated biliary calculi. In many of these cases a diagnosis was made of recurrent or residual stones of the common duct. This number is but a small percentage of the strictures that have been seen at the Lahey Clinic during the past few years. As of December 31, 1945, 176 patients had been referred here and operated upon for stricture of the common bile duct (6).

The causes and methods of repair used have been presented by Cattell (10) however it

might be well to review them briefly at this time. The causes are (1) ulceration from gallstones (2) inflammation of common bile duct (3) operative injuries (a) excision of portion of duct (b) clamping during operative hemorrhage (4) following subtotal gastrectomy (5) chronic sclerosing pancreatitis.

By far the most common cause of stricture is operative injury which comprises over 80 per cent of the cases.

The prevention of benign strictures as far as operative injury is concerned is based mainly on adequate exposure (32) so that a careful anatomical dissection can be carried out. Lahey has mentioned this fact many times (30-33 35).

The diagnosis of stricture is often difficult to make. It is frequently confused with common duct stones or carcinoma of the bile duct or pancreas. If after a cholecystectomy jaundice develops immediately (in 1 to 3 weeks) or if the fistula at the site of the T tube drains over a long period of time and if in addition there is a history of operative injury or hemorrhage a stricture probably is present. Patients with stricture gradually become jaundiced following the closure of the external biliary fistula and usually remain so until another operation is done or an internal fistula develops in the interim.

Twenty three strictures of the bile duct were encountered in this series. 4 had been caused by operative injury, 1 by cholangitis, 17 by fibrosis of the sphincter of Oddi and 1 by fibrosis of the cystic duct and chronic cholecystitis.

Fibrosis of the sphincter of Oddi is not an uncommon condition. It was found in 17 cases in this small series. It occurs usually following previous bile duct surgery in which the sphincter may have been dilated too vigorously. As proof that this is not always the cause however it was present in 2 cases in which the patients had not had previous surgery and only 1 of these patients had common duct stones.

POSTCHOLECYSTECTOMY SYNDROME

The causes of symptoms following cholecystectomy with or without choledochostomy are many. Various aspects of this subject

have been discussed by numerous authors (7, 11, 13, 14, 16, 21, 24, 25, 28, 44, 53, 54). The different causes as they were found in this series are briefly outlined: (1) benign stricture of common duct (2) residual pancreatitis or hepatic disease (3) common duct stones (4) irritable bowel or functional indigestion (132 cases), (5) gall bladder or cystic duct remnant (12 cases), (6) biliary dyskinesia and spastic sphincter of Oddi (7 cases), (7) adhesions of duodenum to gall bladder fossa (8 cases), (8) duodenal diverticulum simulating gall bladder colic.

The first three causes have been discussed elsewhere in this paper.

Irritable colon or functional indigestion was present in 12 per cent of the cases. A diagnosis of this condition was usually made preoperatively and medical therapy instituted. According to Ivy and Goldman constipation may cause stimulation of various splanchnic nerves and predispose to stasis of the biliary tract by decreasing bile formation and by increasing the resistance to the flow of bile through the sphincter of Oddi into the duodenum. Wilkinson stated that symptoms of irritable colon are just as varied as those of cholecystitis. There may be epigastric distress, belching distention, shifting abdominal pain and nausea and vomiting. Recognition and treatment of this condition will decrease the incidence of poor results after cholecystectomy particularly in that group of patients who complain of dyspepsia alone.

A remnant of the gall bladder or cystic duct has been recognized for several years (12, 21) as a possible cause of distress after cholecystectomy. We believe that, with adequate exposure and anatomical dissection, such a surgical error can always be avoided. In this series there were 12 cases, 7 with stone in the remnant and no common duct stones, 4 cases with a remnant without stone and choledocholithiasis and 1 case in which stones were found in the remnant and the common duct was not explored. One should be able to achieve a good result by removing the cystic duct remnant if the first operation were clearly indicated (21).

We consider biliary dyskinesia and spastic sphincter of Oddi in the same category. The

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cause of this condition is not definitely known. Mild symptoms of dyskinesia are undoubtedly more frequent than our few cases would indicate. The only patients who were operated on in this group were those who did not respond to strict medical management. There were 7 patients, 2 with jaundice without common duct stones and 5 with no jaundice and no common duct stones.

Adhesions of the duodenum to the gall bladder fossa following cholecystectomy constitute a condition about which very little is written. This condition is very common, but rarely causes severe symptoms. It is usually recognized only at operation, the symptoms having been thought to be caused by common duct stone or stricture. The duodenum is firmly adherent and usually rotated so it may partially obstruct both the duodenum and the common duct. There were 8 cases in this series in which symptoms occurred. All 8 patients had pain in the right upper quadrant either intermittently or constantly, all had occasional nausea and vomiting and there was a history of jaundice in 3 of the cases. All were relieved by release of the adherent duodenum and by placing the omentum in the fossa so that the adhesions would not recur.

In order to prevent this complication one should carefully repentonealize the gall bladder fossa and common duct and then place a small portion of the omentum in this region between the liver and duodenum.

Duodenal diverticula are usually symptomless. They were found to be associated with biliary tract disease in 9 cases. It is not believed necessary to resect them unless they have a very narrow neck. Resection was done only once (together with cholecystectomy) in this series. In 1 case which has already been reported (24) the diverticulum was not found until the fourth abdominal operation. This diverticulum contained gallstones and had a narrow neck. Resection of the diverticulum gave complete relief.

SURGICAL PROCEDURES

Cholecystostomy was done in only very ill patients who had some other complicating disease. Drainage of the gall bladder was done in 6 cases (0.54 per cent) and all were for

acute cholecystitis. This incidence is much lower than any other reported series of cases known to us.

Cholecystectomy alone was done in 582 cases. Cholecystectomy with choledochotomy was done in 454 cases.

There were 114 patients who had secondary surgery of the biliary tract. Three patients had operation directed toward the treatment of peptic ulcer along with cholecystectomy, 1 a gastric resection, and 2 had gastroenterotomy.

In 9 cases cholecystectomy was performed for acute cholecystitis occurring during the immediate postoperative course of some other condition, 3 after abdominoperineal resection, 2 after thyroidectomy, 1 after transurethral resection of the esophagus, 1 each after a peptic laparotomy and a transurethral resection. Appendectomy was performed in conjunction with the biliary tract surgery in 400 cases. We do not believe that appendectomy increases the mortality or morbidity. During the pathologic examination in one of the appendectomy cases, a carcinoid of the appendix was discovered.

POSTOPERATIVE COMPLICATIONS

Seventy-two of the 1104 patients (6.5 per cent) had postoperative complications.

Stricture of the bile duct thought to have been caused by operative injury occurred in 1 case. Inflammatory stricture occurred in 1 case. This patient had a small but grossly thickened and acutely inflamed common duct at the time of initial operation when stones were removed from the duct and a contracted gangrenous gall bladder was removed. A tiny T tube was inserted, but this became plugged and had to be withdrawn. In the course of the next 3 months fibrous stenosis of the middle third of the common duct developed through which a 1 millimeter lumen persisted. At a second operation the stenotic portion was resected and the ends anastomosed over a vinyl catheter tube.

Atelectasis or pneumonia or both was a complication in 10 patients (0.9 per cent). Phlebitis or phlebotrombosis developed during the immediate postoperative period in 16 patients (1.45 per cent). Eight patients

had pulmonary emboli 2 fatal and 6 nonfatal. One pulmonary embolus occurred shortly after a varicose vein ligation and retrograde injection 13 days after the cholecystectomy. None of the patients with pulmonary emboli had clinically detected evidence of phlebitis.

Major wound infection occurred in 7 patients 3 of these had cholecystectomy and appendectomy 1 had appendectomy and choledochostomy and 3 had simple cholecystectomy. The abdominal drains emerged through the primary incision in all of these cases.

Right subdiaphragmatic abscess occurred in 1 case and there was 1 left subdiaphragmatic abscess in a case of situs transversus in which a pseudodiverticulum of the transverse colon was excised in addition to cholecystectomy. There was 1 patient who had a right subhepatic and right subdiaphragmatic abscess appendectomy and cholecystectomy were done in this case.

Two patients had wound dehiscence 1 of these had cholecystectomy appendectomy and choledochostomy with choledocholithiasis.

Hernia in the scar occurred in 16 cases (1.45 per cent). One patient had associated wound infection, 5 had cholecystectomy and appendectomy 1 had cholecystectomy and choledochostomy without common duct stones and 1 had secondary biliary tract surgery.

Bacillus welchii peritonitis occurred in 1 patient and was fatal. This rare complication has been reported before (2). There have been only 3 cases in 5 000 operations on the biliary tract. It is thought to be caused by reflux of infected duodenal contents into the common duct after dilatation and irrigation of the common duct with isotonic solution of sodium chloride. We now advise that the catheter used be kept in the common duct and not be passed through to the duodenum and only moderate dilatation of the sphincter be done.

There were 2 patients who had an exacerbation of gout during their postoperative convalescence. Two had parotitis.

One patient had a massive gastric hemorrhage on his fourteenth postoperative day and a posterior gastroenterostomy was done. He now has symptoms of a jejunal ulcer.

MORTALITY RATE AND ANALYSIS OF DEATHS

There were 1104 operations, 10 deaths making a mortality rate of 0.9 per cent.

Analysis of deaths. One death occurred in a woman 62 years old who had cholelithiasis choledocholithiasis, and a diaphragmatic hernia which was repaired at the time of the cholecystectomy and choledochostomy. She died on the twelfth postoperative day. Autopsy showed *Bacillus welchii* peritonitis pancreatitis and cerebral thrombosis.

Death occurred in a 28 year old man with cholelithiasis in whom cardiac arrest took place after a spinal anesthesia. He died on the fifteenth postoperative day of pneumonia and lung abscess.

A third death was in a 65 year old woman who had cholelithiasis, choledocholithiasis, and duodenal ulcer. She had a cholecystectomy choledochostomy and subtotal gastric resection. Death occurred on the fourth postoperative day of bronchopneumonia.

A fourth death was in a 63 year old man who had acute cholecystitis with common duct stone. While getting out of bed 12 days after cholecystectomy and choledochostomy he had a massive pulmonary embolus.

The fifth death was in a 55 year old man with interstitial pancreatitis and cholelithiasis. He died on the eleventh postoperative day after cholecystectomy and choledochostomy of massive pulmonary embolus confirmed by autopsy.

The sixth death occurred in a 50 year old man with cholelithiasis he had a hemoptysis 36 hours postoperatively which was thought to be caused by a pulmonary embolus. He died shortly thereafter and autopsy showed massive lobar atelectasis secondary to a large mucous plug in a primary bronchus.

A 65 year old woman with cholelithiasis had a cholecystectomy and died on the seventh postoperative day of coronary occlusion the diagnosis being corroborated by an electrocardiogram.

A 74 year old man with acute cholecystitis died 24 hours after cholecystectomy. Autopsy was not performed death was thought to be caused by liver failure.

A 50 year old woman with a cystic duct remnant, chronic pancreatitis and hepatitis

died 24 hours after excision of the cystic duct remnant and a choledochostomy. No autopsy was obtained. Death was thought to be caused by "liver failure."

A 57 year old man had had 3 previous operations and was in very poor condition from a gastropancreaticoduodenal cutaneous fistula. He died on the thirteenth postoperative day after cholecystectomy, choledochostomy, closure of a gastric fistula, and drainage of a pancreatic fistula and cyst. There was a large mass in the head of the pancreas. Curettage of the base of the pancreatic tumor showed mucinous carcinoma of pancreas. No autopsy was obtained.

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A STANDARDIZED METHOD FOR ASSESSING THE STRENGTH OF HAND AND FOOT MUSCLES

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SATISFACTORY examination and periodic re-examination of large groups of patients with injuries to the peripheral nerves calls for a standardized method of measuring muscle strength. The method should be simple and rapid. The results should be reproducible and permit, in the hands of different examiners, the accurate evaluation of change in function. This is clearly a practical problem in contrast to the physiologic attempts to determine in the strict sense, the power of a single muscle in foot pounds or kilogram meters. Hence no reference will be made to this literature.

Our interest was concentrated on the muscles of hand, fingers, foot and toes. It was our desire to measure instead of estimate the resistance a patient could muster by contracting a group of muscles supplied by one nerve trunk. We decided to explore the reliability and the reproducible character of measurements obtained with the common spring scale, a device readily adapted to the movements of the extremities.

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Lovett, studying patients with infantile paralysis, seems to have been the first to make systematic use of the spring scale for measuring muscle function. Martin, on Lovett's suggestion, developed the method in the Physiological Institute of Harvard. Tables of standard muscle strength were established for all groups of muscles of normal children for ages from 4 to 16 years. Successive tests at short intervals showed the readings as to individual muscle groups to be in a large percentage of cases remarkably constant. Pollock used this method in nerve injuries during the first world war. Unfortunately no one seems to have followed his good example.

The figures gained in our examinations would be of limited practical value unless expressed in percentage of a certain norm. This brought up the old question of the yard stick of normalcy. At first we took for comparison, the corresponding muscle group of the patient's normal side. This doubled the time of examination and gave altogether unsatisfactory results since some patients had developed unusual muscle strength on the normal side as a compensatory factor.

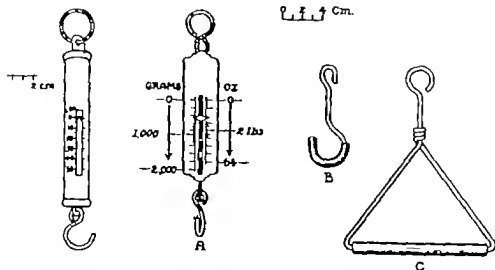


Fig. 1. Spring scales and appliances for measuring muscle strength. For their application see Figures 2 to 5.

SURGERY GYNECOLOGY AND OBSTETRICS

TABLE L—AVERAGE STRENGTH OF MOTIONS OF A HOSPITAL POPULATION EXPRESSED IN POUNDS (450 GRAMS)

		Upper Extremity	Mean M	Standard deviation of Mean SD	Standard error of mean SEM	Range for normal Male D
Median nerve	Index	Flexion, and phalanx (flexor digitorum profundus)	4	2.0	5	10—14½
	Thumb	Flexion, and phalanx (flexor pollicis longus)	3	5	5	10½—14½
		Flexion prox. phalanx (flexor pollicis brevis)	3		5	10½—14½
		Ulnar abduction (abductor pollicis brevis)	3		5	10—14
		Opposition (opponens)	30+			
Wrist	Flexion				10—14½	
Ulnar nerve	Index	Flexion, and phalanx (flexor digitorum profundus)	8	6		8—10
	Little finger	Abduction (abductor digiti quinti)	5	6		— 14
		Adduction (adductor dig. quinti)		8	5	13½—16½
		Adduction, first (interossei)				14— 5
	Thumb	Adduction	10			13½—14½
Radial nerve	Wrist	Extension	30+			
	Fingers	Extension, proximal phalanx (extensor digitorum com. mass.)	5		7	4½—11
		Extension, distal phalanx (extensor longus)	12			9—17½
		Extension proximal phalanx (extensor brevis)	5			9½—14½
	Thumb	Radial abduction (abductor pollicis longus)				
Lower Extremity						
Right posterior nerve	Toes	Flexion	40		5	10—100
	Foot	Flexion (plantar flexion)	30 5			36½—44
		Inversion (tibia posterior)				7— 5
Peroneal nerve	Toes	Extension	5 5			— 5
	Foot	Extension (dorsiflexion) (tibia anterior)	30 5	6	5	17—24
		Eversion (peroneus longus and brevis)	30 6	7		24—24

Right handedness and left handedness had to be considered as well as the general muscular development in manual workers, in contrast to clerical workers.

It seemed impractical to compute a mean for each professional group and to select from the several means the correct standard for each examinee. We decided to determine the means (M) of the strength of various muscle groups, their standard deviations (SD) and standard errors (SE) in a hospital population which as a group did not show the fitness of combat soldiers. The random sample consisted of persons showing no nerve or muscle weakness and included manual and

clerical workers, as well as right handed and left handed persons (Table I).

To minimize the unavoidable variations, a standard method for measuring muscle function in patients with nerve injuries was developed. The method proved clinically adequate in use with more than 1,000 patients during a period of 2 years and the norms were found to be satisfactory provided that a few precautions were used. We believe that our results, as tabulated, permit a sufficiently accurate and rapid method for determination of the extent of motor nerve damage and of the progress of its recovery.

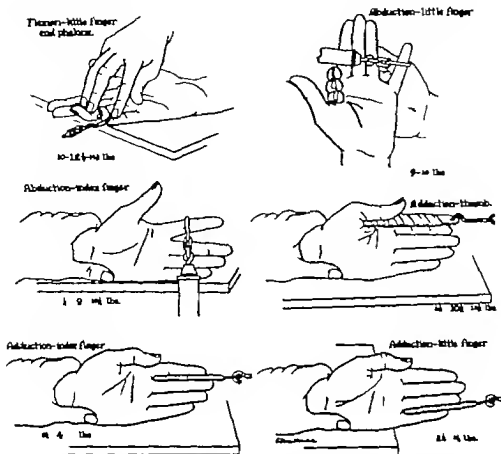


Fig. 2. Ulnar nerve.

Figs. 3-5 Standard position and fixation of hand and foot and direction of traction for measuring the strength of various characteristic movements. They are devised to prevent trick movements and minimize interference of auxiliary muscles. Presence or absence of contraction of the corresponding muscles has to be verified by inspection and palpation. The large figure indicates the mean strength of a hospital population, the small figures the range (\pm SD) expressed in pounds (4.50 grams)

A METHOD FOR MEASURING MUSCLE POWER IN THE HAND AND IN THE FOOT

The apparatus used by us for these measurements are (1) a spring scale indicating up to 50 pounds and calibrated against a certified scale a small scale with a 64 ounce capacity is handy for measuring the first appearance of strength in hand and finger muscles (2) a wire about $\frac{3}{16}$ inch thick and about 4 inches long one end of which is bent to hook into a ring of the scale, the other end bent into an open loop of about $1\frac{3}{4}$ inch diameter covered with a rubber tube (3) the same type of wire formed into an isosceles triangle of 4 inches length the base of which is padded with rubber the opposite tip bent to hook into the scale, (4) a thin metal plate about 4 inches long and 1 inch wide with a hole in one end for the scale. The plate is

wrapped in tape to give a good grip. These fittings are shown in Figures 1 and 2.

Directions. The patient is informed of the principles of the method and admonished energetically and repeatedly during the entire examination to apply all possible force in resisting the pull of the scale. Hand fingers or leg have to be fixed by the examiner in such a manner that the patient is prevented from pulling with arm and leg instead of using the muscle groups under scrutiny. Figures 2 to 4 show the procedure in testing the forearm hand or finger muscles. In the foot plantar and dorsal flexion of foot and toes eversion and inversion of the foot are tested (Fig 5). This same method could be applied for measuring other muscle groups in the arm and leg.

It is important to hold hand fingers and foot respectively, exactly as indicated and to

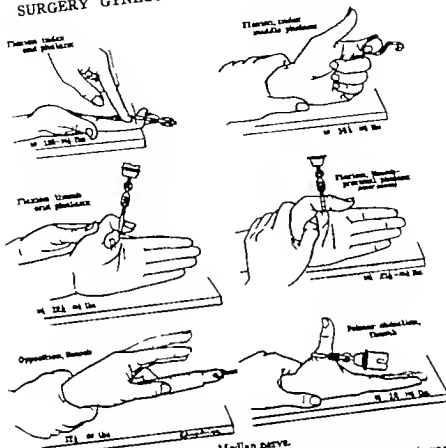


Fig 3 Median nerve.

exercise traction in the given direction. Patients develop unconsciously innumerable trick movements and learn to use auxiliary muscles. The positions of extremities, hook and scale have been so chosen as to exclude—as far as possible—such undesirable errors, as the contraction of the finger extensors in, e.g., the contraction of the index or little fingers. Nevertheless, inspection and palpation of the muscles or muscle groups under scrutiny should not be omitted.

The results were recorded, either directly in pounds or in percentage of the normal, depending on the purpose for which they were used (Figs. 6 to 8). The large figure (MI) was used to compute the percentage of deviation from the norm. The range (small figures, $\pm 2SD$) gives a general idea of what strength can be expected in a certain movement. The pounds given on Figures 2 to 5 are slightly at variance with those of Table I. They are rounded to a quarter of a pound in contrast to the calculated values of Table I.

The unit of measurement was noted on each chart with the date and name of the patient and the examiner. We found special remarks sometimes useful, e.g., that the patient did or did not apply maximal force, that he seemed to be in good or poor condition that it was a very hot day, etc.

Figure 6 gives an example of loss and gradual improvement of function following severance and suture of the median nerve at the wrist. There was no function in any of the hand muscles when first examined 3 months after suture of the nerve. In addition, there was a mild weakness from disuse in the ulnar musculature. At the time of the last examination 14 months after operation all intrinsic muscles innervated by the median nerve were active with the exception of the abductor pollicis brevis which frequently fails to return. The end phalanx of the index finger could not be moved because of partial ankylosis. The ulnar innervated muscles had returned to almost normal strength.

which does not permit total removal of the peritoneal sac must be viewed with misgivings as to its adequacy. The inferior or femoral approach does not permit visualization of any structure above or internal to the inguinal ligament and therefore it precludes total extirpation of the sac. This route only permits ligation of the femoral variant at its juncture with the parent sac. Further it is not possible to determine the presence or absence of other locules of the sac or to appraise the integrity of the structures of the floor of the canal from this approach. Apropos, I should like to point out that ligation of the peritoneal locule at the level of the femoral ring is comparable to obliteration of the funicular component of the sac at the external or aponeurotic ring, a procedure which has been abandoned as inadequate since the exposure of the inguinal canal by Championniere in 1831. The technique of removal of the sac should follow a well established plan (Fig. 1). The femoral variant should first be inguinalized after which it is handled as in any inguinal hernia (Fig. 2). Should the femoral locule arise from the direct component of the sac, a frequent finding, an intermediary step of indirectizing the direct variant (Fig. 3) will be necessary before complete removal of the sac.

2 *Insufficiency of the inguinal ligament* Structural inadequacy of the inguinal ligament should be suspected in all recurrent hernias and in those primary hernias exhibiting diffuse weakness of the wall. The presence of a defect in the floor which has no clearly definable fascial boundary further enhances this suspicion. However, conclusive evidence of ligamentous insufficiency may not be recognizable without exposure by careful dissection of each parietal stratum. After mobilization of these structures, determination of the tensile strength of the inguinal ligament and that of the related fascial planes is simplified. Sharing in importance with the integrity of this ligament is the relative fixity of its inferior margin which can be demonstrated by downward pressure directed from within or by making traction on the ligament outward. If either of these maneuvers produce widening of the interligamentous or subinguinal space particularly if there is concomitant anterior curving or convexity of its inferior margin the ligament is considered inadequate for reparative purposes. Often the diffuse bulging encountered in the presence of such coexisting structural deficiency is frequently mistaken for a femoral hernia.

To overcome the deficiency of the inguinal ligament 3 alternatives have been proposed (1) substitution of Cooper's ligament, (2) running a

suture, preferably fascial, through the inferior margin of the inguinal ligament and through Cooper's ligament, which steadies the former (the criterion for this maneuver is a ligament of normal density with no attenuation but possessing undue laxity) and (3) when there is practically total destruction of the inguinal ligament, replacement with a pedicled fascial graft.

Lotheissen's ingenious idea of substituting Cooper's ligament for the inguinal ligament for anchorage of the parietal wall has received more sustained favorable reception than either of the other technical procedures. Among the chief proponents of this procedure are Dickson, Fallis McClure, and Harkins and Swenson. However neither Lotheissen nor his contemporary Narath made any attempt to implement the repair by closing the interligamentous triangular space. In those cases in which only ligamentous laxity is present, Moschcowitz, and later Seelig and Tuholske advocated suturing the inferior margin of the inguinal ligament to Cooper's ligament. Payne employs a pedicled suture from the external aponeurosis for the closure of this space. However, this maneuver does not obviate the necessity of complementary repair of the floor by Bassini's method or one of its modifications. Therefore Cooper's ligament plays only an auxiliary role in the Moschcowitz technique. Ordinarily one should expect long standing, massive hernias to predispose to weakness of the inguinal ligament in contrast to a higher incidence of friability or fragmentation of the ligament in cases of recurrent hernias.

Methods of replacing Poupart's ligament have been described by Wilmoth Cowell, and Turner which have definitive variations but are fundamentally alike. They consist in transplanting a pedicled fascial flap from the anterior surface of the tensor fascia femoris muscle and fixing its inferior margin to Cooper's ligament. Strategically it would seem that in rebuilding the floor of the canal this maneuver offers no advantages and is technically more difficult than transfixion of all the parietal layers jointly to Cooper's ligament. The latter reparative innovation has its counterpart in Joyce's method differing only in substituting Cooper's ligament for the inguinal ligament. Wangenstein's iliotibial tract transplantation is indicated when inadequacy of the fascia transversalis is also present.

3 *Marked laxity of the parietal strata.* Initially the weakness of the floor of the canal is congenital arising from maldevelopment and maldescent of the gubernacular cord and from anomalies occurring during the process of differentiation of the

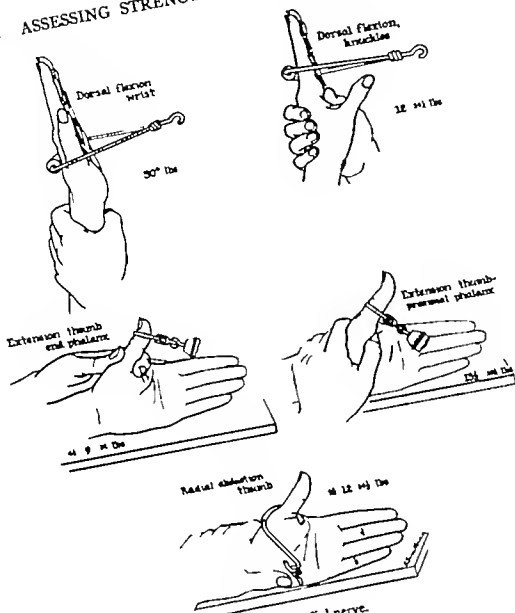


Fig 4 Radial nerve.

Figures 7 and 8 record the course of an ulnar nerve paralysis and lysis in the middle of the forearm. Figure 7 shows the increasing strength in pounds. Figure 8 in percentage of the norm. The last illustration of this figure indicates practically full return of function in all muscles with the exception of the abductor indicis. This muscle was seldom used in the patient's work. The abductors of the first and second fingers seem to be innervated by a twig from the median nerve.

This form of recording gives at any time an immediate survey of the progress of recovery following a nerve lesion and a survey of the functional deficit in percentage of the norm.

DETERMINATION OF RELIABILITY OF THE METHOD

Controls It remained to demonstrate what degree of reliability could be expected from measuring the strength of voluntary muscle contractions by means of the spring scale with the described precautions. A comparative study was made for this purpose on the abductor digiti quinti muscle in 76 patients with ulnar nerve lesions. The strength of this muscle and its gradual increase over a longer period of time was determined in sequential examinations and expressed in percentage of the normal. Simultaneously the electromotive force (EMF) generated by this muscle on maximal electrical stimulation of the ul-

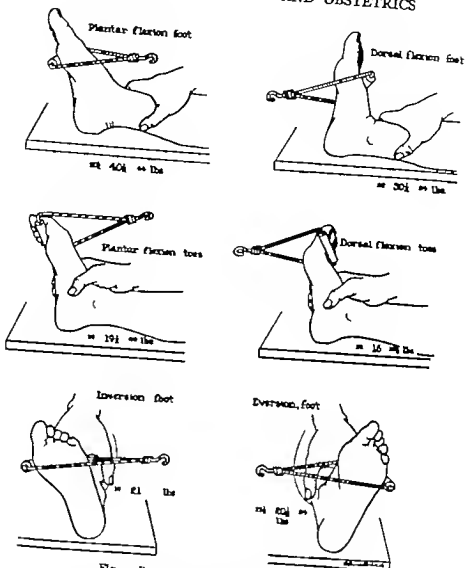


Fig. 5. Posterior tibial and peroneal nerves.

nar nerve (amplitude of electromyogram) was measured in millivolts and expressed in percentage of the value obtained on the normal side of the patient. This procedure may be called an objective method. The values obtained by the two methods of examination were plotted against each other. The scatter diagram (Fig. 9) shows a high degree of relationship ($r = +0.79$) between (1) the EMF on maximal nerve stimulation and (2) the strength of voluntary contraction, both expressed as percentage of normal, in the same muscle at the same time. A standard error of 0.04 indicates that r' departed highly significantly from zero.

We were interested in this context in the reliability of the percentage values of voluntary strength. Strength was therefore chosen as the dependent variable (Y). The standard error of estimate in Y (\hat{Y}) was found to be 12.7 per cent. RR is the least squares regression line.¹ The bands of normality on each side, $2\sigma Y$ (25.4%) are shown as dotted lines. This permits one to estimate or predict the value of strength (\hat{Y}) if the EMF (X) is known. Insert the determined value of EMF in per cent of the normal on the abscissa, follow this line up to the point where it bisects

The meaning of the Y intercept (OR) will be discussed in another context.

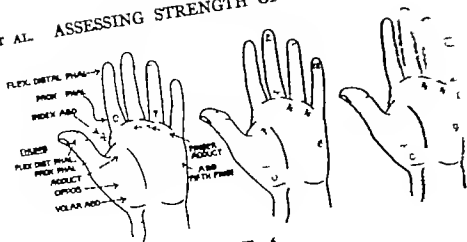


Fig. 6.

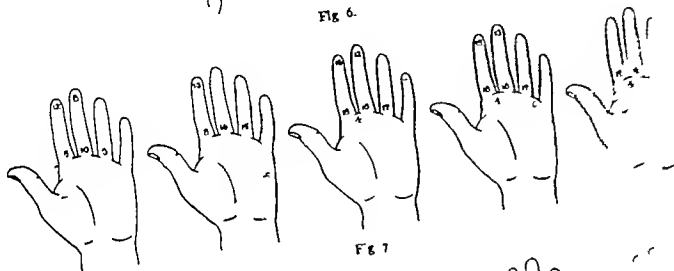


Fig. 7.

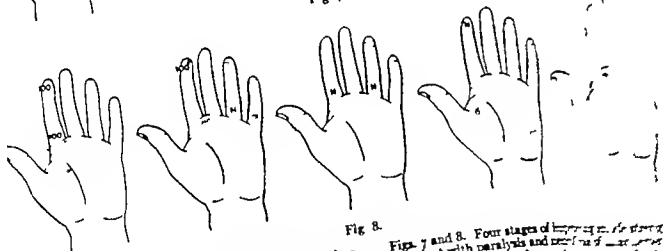


Fig. 8.

Fig. 6. Three stages of improving muscle strength in a patient with median nerve interruption, and suture above the wrist. From left to right, 3.6 and 14 months after operation. The first picture explains to which motions the standard location of numbers refers. Dotted numbers, originally written in red, indicate deficient strength. Strength in pounds (450 gm.)

Figs. 7 and 8. Four stages of improving muscle strength in a patient with paralysis and median nerve interruption at the middle of forearm. The four pictures show the time before operation, 3, 6, 9, and 12 months after operation. Figure 7 gives the strength in pounds (450 gm.) measured with help of a scale, Figure 8 the percentage of normal. For details see legend of Figure 6 and text.

the regression line and read the predicted value of strength in per cent of the normal on the ordinate.

The 0.99 fiducial limits of the coefficient of correlation are between 0.61 and 0.89. This means that taking an indefinitely large

number of persons homogeneous with the 76 actually examined it is highly likely that the coefficient of correlation will fall within the limits of 0.61 and 0.89.

The scatter diagram shows that of 76 or approximately 95%, of all patients falling with

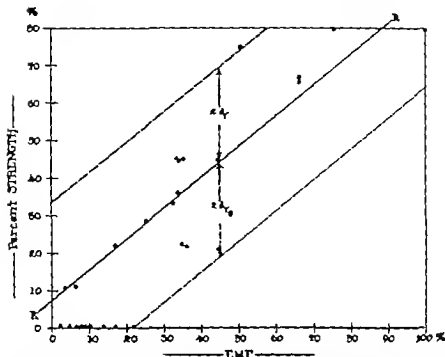


Fig. 9. Scatter diagram of strength in the abductor digiti quinti, measured by means of a spring scale and expressed in percentage of the normal, plotted against the electromotive force generated by the same muscle on maximal stimulation of ulnar nerve at elbow measured in mV (amplitude of electromyogram) and expressed in per cent of the corresponding value in the patient's normal arm. Full dots, nerve sutures. Open rings, neurectomy. R.R., fitted regression line. $\pm 2Y$, the bands of normality on each side. Y , standard error of estimate in Y .

in the limits of $RR \pm 2Y$. This percentage corresponds very closely with the results expected when a straight regression line is appropriate to the data and when the points are normally distributed around the line. We may therefore use this line and the limits of $RR \pm 2Y$ as the normal region. If a point falls outside these limits, it is likely that there is something extraordinary about the patient. If the point lies above the upper limit we have no interest in the extraordinary cause in this paper. If it lies below the lower limit it is legitimate to take the result as an indication of inadequate voluntary contraction. The method here developed seems pertinent to the problem but more reliable values for $RR \pm 2Y$ could be obtained from enlarging the sample.

The results of the spring scale method may therefore be called reasonably reliable, reproducible and comparable. Furthermore, Figure 9 gives a reasonable basis of action

until larger studies are made. The measurements provide a good record of individual return of muscle strength from zero to one hundred per cent, or wherever the curve levels off.

Limitations. The values obtained with this method are approximations. Differences of less than one half pound should be considered—as far as our experience goes—within the range of the experimental error in the small hand muscles, whereas differences of 1 or 2 pounds may be neglected in the stronger muscle groups. Hence, not much change could be expected from examinations at short intervals in the case of a regenerating nerve. Our routine examinations were spaced 2 to 3 months apart beginning as soon as the first signs of returning function were observed.

SUMMARY

A standardized method of measuring the function of various muscle groups in hand, fingers, foot and toes by means of a spring

ACUTE PANCREATITIS

II An Experimental Study with Special Reference to X ray Therapy

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IT is now commonly recognized that the method of choice for treating acute non-suppurative parotitis is with roentgen rays. About 1938 Morton and his co-workers in Rochester New York were struck by the interesting analogy between the parotid gland and the pancreas both of these glands were of the serous type and blood amylase levels were elevated with disturbances of either. In 1940 Morton and Widger encouraged by their early experiences with the roentgen treatment of acute pancreatitis, published their first clinical report. In 1945 we reviewed the clinical and pathological records of the 8 cases of acute pancreatitis treated by roentgen therapy in the Peter Bent Brigham Hospital in Boston together with the 13 cases then reported in the literature(1). The series was too small and the available data too scanty to draw any conclusions. In an endeavor to place the x ray treatment of acute pancreatitis on a factual, rather than an empirical foundation the following experimental studies were undertaken.

METHOD

In order to create acute pancreatitis in our investigation we adopted the method described by Rich and Duff in 1936 in their classical study on the pathology of experimental pancreatitis in dogs. Under nembutal anesthesia the second portion of the duodenum was opened. The duct of Santorini was cannulated with a blunt No. 25 needle and bile, freshly aspirated from the gall bladder was injected into the pancreas. When less than 2 cubic centimeters of bile was slowly injected into 16 kilogram dogs at a pressure lower than 18 centimeters of water the ductal tree of the pan-

creas was filled but not ruptured. In a matter of a few minutes acute edema of the pancreas immediately developed while the organ was under direct vision (Fig. 1). The lobules became widely separated by a transparent transudate which microscopically showed a few extravasated leucocytes but primarily an interacinar edema. When 2 to 10 cubic centimeters of bile was rapidly injected into dogs at a pressure over 18 centimeters of water the ductal tree of the pancreas was ruptured, the immediately visible interlobular edema became bile tinged (Fig. 2) and in a matter of a few minutes small petechiae appeared in the acinar substance. Microscopically the pancreas at this time displayed large numbers of extravasated erythrocytes, leucocytes, fibra, and granular debris. Several hours after the injection of bile this type of pancreas (Fig. 3) showed numerous yellow plaques of fat necrosis, both in the substance of the pancreas and on the omentum, mesentery and peritoneal surfaces.

RESULTS

Figure 4 shows the curves of serum amylase levels from 10 acute experiments over a 12 hour period. After the induction of acute pancreatitis, blood samples were periodically taken until the dogs were sacrificed. The solid lines represent steadily rising serum amylase levels in dogs which displayed severe necrosis at autopsy. The broken lines represent less acute rises in serum amylase levels in dogs which showed only edema at autopsy. The former received 2 to 10 cubic centimeters of bile under great pressure, thus rupturing the ductal tree. The latter received less than 2 cubic centimeters of bile under mild pressure and showed no extravasation of bile outside the pancreatic ducts. In the former blood amylase levels continued to rise until the end of the 12 hour period of observation, while in the latter during the same interval serum

From the departments of surgery and radiology, Peter Bent Brigham Hospital, and from the Laboratory for Surgical Research, Harvard Medical School. Dr. Chisholm, Arthur Tracy Cabot Fellow in the Laboratory for Surgical Research, Dr. Seibel, Resident in Radiology, Peter Bent Brigham Hospital.

Dose: 1 milligrames per kilogram administered intravenously.

amylase was either approaching or had returned to normal levels.

Figure 5 shows the curves of serum amylase levels from 10 acute experiments followed over a 7 day period. These operations were done with aseptic precautions and blood sampling was conducted periodically until the dogs were sacrificed. Again the solid lines represent animals receiving injections of large amounts of bile under increased pressure; these dogs uniformly sustained quite high serum amylase levels which only slowly fell toward normal. At autopsy they showed varying stages of subsiding pancreatic necrosis. The broken lines represent dogs receiving injections of less than 2 cubic centimeters of bile under low pressure in which amylase levels rose to less high levels returned to normal sooner than in the companion series and at necropsy showed only the end results of an acute edema of the pancreas.

The next objective of the study was to ascertain what was the response of the normal pancreas to x ray therapy as reflected by alterations in the blood amylase levels. Figure 6



Fig. 1. Acute edema of the pancreas a few minutes after gentle retrograde injection of bile into the duct of Santorini.

indicates the response in 6 dogs to a single treatment of 90 r each (represented by the solid lines) and in 5 dogs to 200 r each (represented by the broken lines). These doses were delivered over a 15 square centimeter area of the epigastrium with a skin target distance of 50 centimeters, a peak kilovoltage of 200 a



Fig. 2. Acute edema of the pancreas with petechial hemorrhages a few minutes after vigorous and rapid retrograde injection of bile into the duct of Santorini.



Fig. 3. Acute necrosis of the pancreas a few hours after vigorous and rapid retrograde injection of bile into the duct of Santorini.

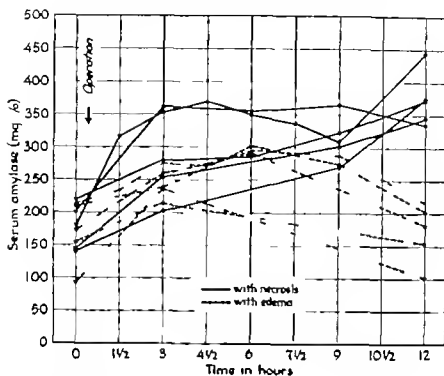


Fig. 4. Serum amylase curves over 12-hour period following the experimental induction of acute pancreatitis

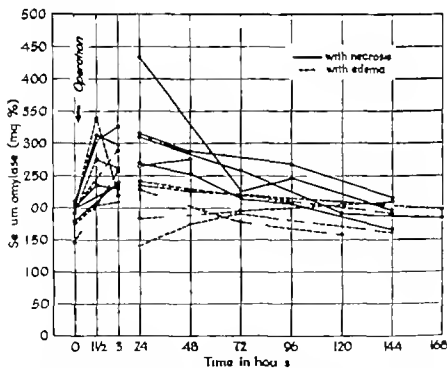


Fig. 5. Serum amylase curves over 7-day period following the experimental induction of acute pancreatitis

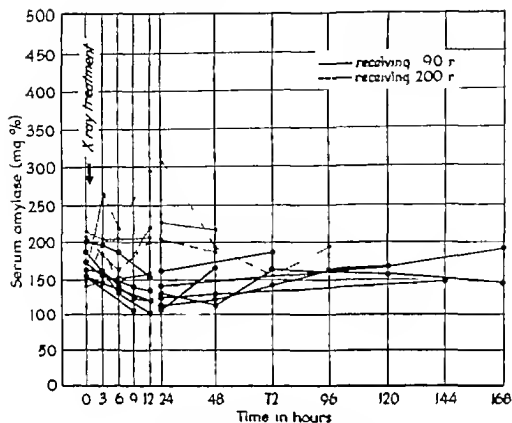


Fig 6 Serum amylase curves over several days following the exposure of the normal pancreas to a single treatment of x-rays

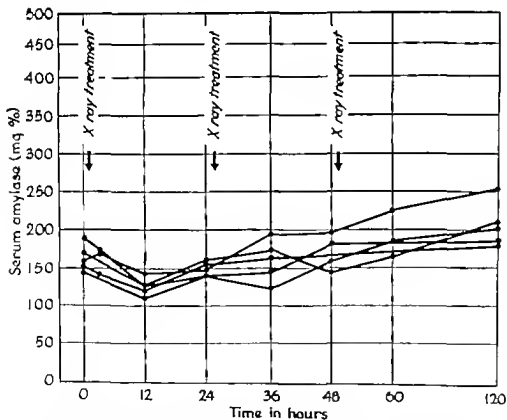


Fig 7 Serum amylase curves over several days following serial exposures of the normal pancreas to divided doses of x rays.

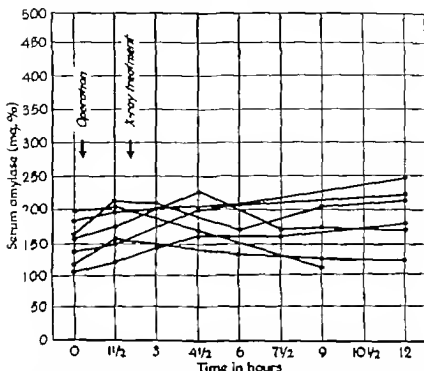


Fig. 8. Serum amylase curves over several days following first the induction of acute pancreatitis, and second, the exposure of the pancreas to a single x-ray treatment.

filter of 1 millimeter of aluminum and $\frac{1}{4}$ millimeter of copper and 18 milliamperes. Of the series receiving only 90 r all had direct drops in serum amylase levels over a 12 hour period with return to or toward normal in 2 to 5 days. At the time of autopsy every pancreas of this series showed subsiding hyperemia but no edema or necrosis. Those dogs receiving 200 r in a single treatment displayed responses with great variations in the serum amylase titers. A few of the larger animals had drops corresponding to the series receiving 90 r. The smaller dogs, however, showed irregular rises in serum amylases and at autopsy had acute edema, petechiae and tiny foci of fat necrosis.

Since both Morton (2) and the radiology service in the Peter Bent Brigham Hospital had frequently employed a series of three consecutive treatments in their human patients with acute pancreatitis we investigated the serum amylase response of normal dogs to three consecutive exposures, 24 hours apart, of 90 r each. Figure 7 illustrates our findings in 5 dogs. There was a uniform depression of serum amylase levels after the first treatment but

with the second and third exposures a diffuse hyperemia with edema ensued. A few showed tiny foci of necrosis. All dogs in this series showed a steady rise in serum amylase levels after the second exposure to roentgen rays.

Finally we combined the aforedescribed methods of first creating acute pancreatitis, and second immediately giving these subjects a single treatment of 90 r to the epigastrium. Seven dogs from this series are represented on Figure 8. All were given sufficiently large injections of bile to create pancreatic necrosis. Although more experiments must be carried out in this manner before irrefutable conclusions can be drawn nevertheless, it is of interest to note that in not a single instance did the serum amylase titers rise anywhere nearly as high as in the original series without x ray treatment. Yet at autopsy all of these dogs showed moderately severe pancreatic necrosis.

COMMENT

On the basis of the above described limited number of observations on experimentally induced acute pancreatitis with and without

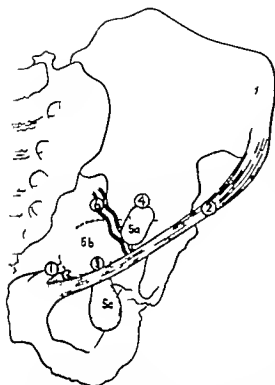


Fig. 2. Mobilization and conversion of multifocal hernial sac. Sac showing indirect, direct, and femoral locules.

abdominal wall plate into three parallel superimposed muscles with their enveloping fascias. Intra-abdominal pressure, traction, gravity muscle contraction, and the expanding hernial mass play their respective roles in contributing to pressure atrophy and ultimate distortion of the parietal wall.

The decision of the adequacy of a structural variant may be an equivocal one. At times, laxity with diminished tone can be differentiated from attenuation of the tissues by stretching only by the experienced surgeon. Aside from embryonal weakness and parietal ageness of the internal oblique muscle, the attenuation of the wall is due chiefly to the progressive enlargement and piston ing action of the hernial mass. From a reparative standpoint the mural deficiency is more important than the type of hernia present. For instance, in large indirect hernias the epigastric vessels are displaced medially and may rest under the rectus muscle. There is, of course, concomitant loss of the obliquity of the canal. With the exception of the position of the epigastric vessels, the parietal distortion is almost identical with that of large direct hernias which require similar corrective measures.

There is another anatomical type of hernia ordinarily not recognized in which the predominant feature is one of systemic mesoblastic weakness, most manifest in the groin. The coexisting sac is small, frequently without an ascertainable neck, and of secondary importance. This type is frequently found in the asthenic individual presenting subclinical myasthenia. It is conceivable that the individuals in whom the angle of divergence of the anterior abdominal wall and the pubic bone is greater and in whom, therefore, the infundibuliform space is larger would be predisposed to hernia in the inguinal sector (Moorgan and Anson). Individuals of this type are frequently rejected by the industrial physician. Surgical measures are required principally to reinforce and make taut the composite atonic wall. In this group the ablation of the sac and closure of the hernial defect will not suffice as it does not correct the generalized laxity of the lower anterior abdominal wall. Since Poupart's ligament participates in the coexisting weakness by reason of its derivation from the external aponeurosis, it should not be used for anchorage but by substitution of Cooper's ligament, which is strong and unyielding, a taut, resistant wall is attained. The repair may be implemented by a fascial suture spanning the interligamentous space, which will simultaneously correct the laxity of the inguinal ligament and further add to the general security of the wall.

4. *Arborization of the sac* Total excision of the sac and its locules is universally accepted as the first cardinal step in the modern repair of hernia. This prerequisite in the surgical treatment of hernia has progressed through many evolutionary phases from ligation of the sac at the external ring ligation in the canal, and, finally after opening of the external aponeurosis, to ligation at the abdominal level of the internal ring. The recognition of the frequency of the polylocular sac has made it obligatory to explore digitally the interior of every sac. Statistical studies of recurrent hernias (5, 6 11 21 28) have shown that overlooked locules and, consequently failure to remove them at the initial repair is a more frequent cause of relapse than is generally believed. Similarly the shortening of the operating time by transecting the scrotal sac without freeing its fundus, as proposed by Stoker and O'Hara, has been abandoned because of incompleteness and because of the occasional complicating hydrocele of the saccular remnant. Incidentally much collateral information may be gained regarding the dynamics of the hernia by understanding the anatomical anomalies predisposing to the development of the devious routes of the sacular variants.

x ray treatment it appears warranted to conclude that too large a dose of roentgen rays may well defeat the purpose for which it is administered i.e. to inhibit enzyme production in the already damaged pancreas. Further more it is suggested by the aforescribed studies that repeated serial exposures of x rays to the pancreas may well have a cumulative effect as deleterious as an initial heavy exposure. And finally that an appropriately small single dose of roentgen rays administered to dogs having experimentally induced pancreatic necrosis appears to inhibit amylase enzyme production with minimization of pancreatic tissue destruction. The application of these observations to the roentgen treatment of acute pancreatitis in humans is clearly suggested.

SUMMARY

1 Observations are reported on the pattern of serum amylase curves in dogs with experi-

mentally induced acute pancreatic edema and acute pancreatic necrosis.

2 Similar observations are reported following periods of x ray treatment to the normal pancreas.

3 Other observations are reported on the behavior of the serum amylase curves in dogs receiving acute experimental pancreatic necrosis followed immediately by a single x ray treatment of 90 r.

4 And finally the application of these observations to the roentgen treatment of acute pancreatitis in humans is discussed.

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EDITORIAL

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DECEMBER, 1947

FUTURE SURGEONS

FOR a hundred and fifty years in this country surgical training was for the most part informal and vague. Over the past five decades various patterns that one might follow to become a surgeon have evolved. In the last twenty years these have become more distinct, with the result that surgical training has been defined and standards established. He who embarks on a career of surgery is confronted with a protracted period of training after graduation from medical school. Heretofore, the surgeon after a long period of residency or apprenticeship with little or no income could expect to receive in a relatively short earning period and by the time he had reached the age when he could no longer work compensation that would equal the total income of his medical confreres. Thus his family although often an addition of his later life had security and provision for education. Today taxes and the trend of fees make the annual net income of the surgeon

during his most active periods of practice so limited that he cannot set aside appreciable savings that will compensate for the long lean years of preparation or provide for his old age.

As medical school graduates continue to embark on surgical careers with an eye to their immediate and future livelihood, they will require and seek a reasonable subsidy during this training period. If incomes are to be limited, a subsidy should be available during the many years of preparation which are required. The cost may be borne by the hospital, the community or the state. Surgery and its specialties more than other divisions of medicine, demands intensive and prolonged training. The present generation has seen those who are now its leaders of surgery struggle through such training. The merit of the system for a few in the past is undeniable, but for the majority both for the present and the future its applicability is questionable.

In this present period after the second World War it appears that many changes may be anticipated. The continuity of trends prior to the war were interrupted and now after the many surgeons who were in the service have returned, new problems become evident. These changes involve all of medicine. There is a strong trend toward hospital practice. Almost every community is planning an increase in the number of its hospital beds and those up to now without hospital facilities are contemplating building them. In the future, a greater number of surgeons will be required. The actual standards of surgery will depend upon the training these surgeons of the future receive.

The emphasis in the building of hospitals has been on the physical plant and equipment.

This is important but more important is the hospital staff which should be continually improved. The quality of the work done by a staff is dependent on the training of its members. There are many large hospitals in the country that have competent and well trained men who take excellent care of patients but who contribute little or nothing to the instruction of those in training. This is particularly true in municipal county and private hospitals located in towns and cities without medical schools. The community should be concerned with the cost of the staff as well as the building and its equipment. A subsidy is needed to pay certain members of the senior staff to carry out a training program and to provide the surgeon in training a sufficient income so that he can maintain a social position equal to that of his peers in other professions.

In effect, it is proposed that all hospitals become teaching institutions, that they serve as the medical centers of the community. Today it is unfortunately true that some small hospitals so far as surgery is concerned may be a liability to a community rather than an asset. Surgeons should be interested in a policy that provides for hospitals of sufficient size properly equipped and staffed to do adequate and sound surgery. The resident system of training in surgery as now employed in many of the university medical centers modified to meet local circumstances might well be utilized throughout the country to the advantage of the future surgeons and their patients. Such a plan should materially increase the number of properly trained surgeons who will be needed in the future and of equal importance it will stimulate the surgeons associated with these

hospitals to keep abreast of advances and create channels through which new information can be easily circulated. Benefits that may accrue will be of greatest value to the citizens of the community in which these hospitals function.

The various insurance schemes for hospitalization have gained great popularity over the last few years and the trend continues. These programs in a period of economic prosperity have been accompanied by a decrease in the number of patients occupying teaching beds. Many hospitals dependent on endowment for support have had a reduction in income and an increase in operational expense. Many hospitals consequently have embraced the insurance plans. As a result ward services have been curtailed and clinical material for training purposes has been reduced. This is unfortunate because patients are benefited when properly used for teaching purposes. The majority of well staffed hospitals could evolve a plan whereby patients who are insured would be taken care of by the senior and resident staffs and at the same time be used for teaching purposes.

Surgeons should understand the problems that confront the medical school graduate as he views surgery as a possible career. The value of a long thorough training in properly staffed and equipped hospitals with adequate clinical material is evident to surgeons but requires emphasis to the profession and laity. The cost of training professional personnel in a hospital should be looked upon as one of the best long time investments that the community which supports that hospital can make.

FRANK GLENN

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THE BOOK SHELF

VIENNA 1947

ALEXANDER BRUNSCHWIG M.D. F.A.C.S., New York, New York

DURING the past summer a mission was sent to Austria by the Unitarian Service Committee under auspices of the World Health Organization (Interim Committee). There were eight members from the United States representing physiology (Visher University of Minnesota), pharmacology (Cattell Cornell), cancer research (Bittner University of Minnesota), internal medicine (Chester Jones Massachusetts General Hospital and Harvard), psychiatry (Wortis, New York University), general surgery (Brunschwig Memorial Hospital and Cornell), neurosurgery (Joseph Evans, University of Cincinnati), anesthesiology (Stewart Cullen Iowa State University College of Medicine). There were two Swiss members, Prof. Alfredo Vannotti (Lausanne) internal medicine and Prof. Herman Mooser (Zurich) hygiene and public health. The purpose of the mission was to acquaint the Austrian medical profession with advances in various fields that had been made in America and Switzerland since 1939 when scientific communication between Austria and the outside world was almost completely cut off and to receive information regarding progress made in the Austrian clinics during this period. This plan was carried out by means of lectures, informal conferences, ward rounds, and operative work on the part of the mission members.

Because of the large number of American surgeons who attended for varying periods the clinics in Austria, especially Vienna, the writer summarizes in the following paragraphs the situation in Austria as observed during the aforementioned voyage.

The Allgemeines Krankenhaus is essentially undamaged and the general activity is quite similar to what was observed by the writer in 1931. The first surgical clinic is headed by Professor Schoenbauer who is active in general surgery and does the neurosurgery for this and other hospitals as

From the Memorial Hospital for the Treatment of Cancer and Allied Diseases, New York.

well. The second surgical clinic is headed by Professor Wolfgang Denk, and is traditionally "The Clinic of Billroth." The author had the privilege of examining the preserved specimen of Billroth's first pylorectomy for carcinoma. Professor Denk is especially interested in thoracic surgery and has recently begun to do total pneumonectomies and transthoracic gastroesophagectomies. He is also Dean of the Medical Faculty. Professor Finsterer is working as hard as ever and continues to direct his *ambulatorium*. His seventieth birthday was recently celebrated by a public ceremony at the hospital. Professor Kahr is head of the first gynecological clinic (Wertheim's clinic) and Professor Antoine is head of the second gynecological clinic (Schauta's clinic). Dr. Schoenbauer is also head of the Institute of Medical History and during the war period his book concerning the history of the Medical Faculty of Vienna was published. This is a beautifully written and illustrated book which will prove a standard reference in years to come.

The shortage of castor is so acute that silk and linen suture material are used almost exclusively. The supply of rubber gloves is also short and this necessitates the use of cotton gloves in some clinics no gloves are used. The author had the experience quite arresting for an American, of operating without gloves and once over the initial surprise it afforded the impression that dexterity was facilitated. There is no shortage of surgical instruments in the operating rooms.

Blood banks are nonexistent. Transfusions, when given (which appears to be not very often) are administered by the direct method. One or two donors are held in a room adjacent to the operating room and lie down on stretchers when utilized. Blood is drawn into a paraffinized Kimpton tube and brought quickly to the patient; the blood is run in by means of a large cannula previously inserted by cutting down upon a large vein.

Little stress is placed upon postoperative fluid balance and in one large clinic there were no out

fits for intravenous infusion by venipuncture. When such measures were to be carried out, a large cannula was inserted into a vein by the cut down method. Sterile physiologic saline solution was generally available but dextrose solutions were not available due to the shortage of sugar. Vitamins C and K are available in limited quantities. No records of daily urine excretion are kept routinely. Continuous gastric aspirations by means of Levine tubes and suction does not appear to be practiced anywhere in Austria. Early ambulation is carried out irregularly.

Sulfa drugs are plentiful. Penicillin is obtainable in only limited quantities and often when it is requested there must be a bacteriological study to prove that the infective organisms are penicillin sensitive. Streptomycin is not available. Opium and its derivatives are not plentiful and indeed in some clinics were not available at all. Small quantities of thiouracil have been provided and a few patients have been treated with it.

The operative work observed was very high grade for the routine procedures. Few or none of the newer operations have been attempted. Total pneumonectomy has not been performed in Austria more than possibly six times, probably fewer transthoracic cardioesophagectomies have been done. No pancreatoduodenectomies have been performed. The heavy metal intramedullary pin (Kutchner pm) is frequently used in fractures of the femur and there appears to be satisfaction with the results. Prefrontal lobotomy has not been carried out. Irradiation therapy for carcinoma of the cervix has never been as extensively employed as elsewhere. Patients with Stages I and II (and often III) receive either the radical vaginal hysterectomy (Schaute) or the radical abdominal hysterectomy (Wertheim). The latter is carried out according to the original operation in which excision of parametrial tissue is emphasized but no attempt is made to remove extensively the lymph nodes along the great vessels of the pelvic wall. The wide use of the term 'Wertheim operation' in the United States to indicate a very radical hysterectomy should be abandoned as Wertheim did not conceive of the operation that is inferred by American surgeons and gynecologists (radical node resections). It was stated that the immediate surgical mortality is about 5 per cent for the Wertheim operation. No recent follow-up studies on results are available.

Peptic ulcer when first encountered is treated medically but this regimen does not appear to be as rigid and vigorous as conceived by internists in the United States. When this has failed resection is done. Duodenal ulcers are managed by

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Neoplasms of the colon are treated in several ways and there is a marked tendency for multiple stage excisions due to lack of penicillin, and poor nutritional state of these patients when they are admitted for treatment. Much of the operative work is done under local or spinal anesthesia. General anesthesia is given by junior assistants who do not remain very long on this service. No physicians specialize in anesthesia but it is contemplated that specialization in the administering of anesthetics will develop.

Specialization in the various surgical fields is not extensively developed. While a rigid separation is made between gynecology and abdominal surgery, and the former is carried out by those who also are obstetricians, urology with its special instrumental armamentaria remains in the general surgical clinics and is the province of senior assistants who devote periods rotating on that service. Orthopedics likewise is not generally separated, although some surgeons are able to confine themselves to that field. Fresh fractures are taken care of in 'traumatic stations' which are adjuncts to general surgical services. Neurosurgery has not developed as a special field nor has thoracic surgery. In Innsbruck (Prof B. Breiter) a surgeon limits his practice entirely to thoracic surgery (Dr Kux) and another entirely to neurosurgery (Dr Sargo). As mentioned these situations are unique in Austria.

Experimental laboratories in connection with the surgical clinics have not been developed and the surgeons have not become interested in some of the newer biochemical aspects of the surgical patient. For example the surgeon there is not familiar with the concept of plasma proteins and their implication for the surgical patient indeed, when the question was raised in connection with a patient undergoing an extensive operation no facility was available for making this determination—it had never been done before in surgical patients. This instance serves as a concrete example of the misfortune resulting when a group of surgeons are more or less completely cut off from international literature and personal exchange of ideas with men from other countries.

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REVIEWS OF NEW BOOKS

THE Danish Surgical Society conferred an award on Dr Aalkjaer in 1944 for the first publication of *Fluids, Electrolytes and Protein in Surgery*.¹ Recently this handbook of 150 pages has been revised and reprinted and now an excellent English translation is available.

Dr Aalkjaer has spent 20 years in developing a simple and practical routine for quantitative replacement of fluids, electrolytes and protein in his general surgical and urologic patients. This manual is a direct and complete description of the reasons for this program and of the means by which it is carried out. As the basis for this progressive work he has used the conclusions of more than 200 authors writing on these subjects at the present time. The comprehension of his approach and the reduction of the many problems to simple terms and usages is to be highly commended.

The book is arranged in three parts (1) the normal physiology of the electrolyte fluid-protein metabolism (2) the pathologic physiology (3) the clinical application. Under these headings the author describes first the fluid, electrolyte and protein requirements of the body and the essential laboratory determinations, then the physiologic changes that occur and finally the methods of quantitative correction of these changes. He clearly describes how quantitative replacement therapy can be used in a small hospital. Details are given as to adequate methods of laboratory analyses of protein, chloride and carbon dioxide, preparation of fluids, collection of blood and methods of administration. Excellent brief surveys on the differences of new and old bank blood, or the use of plasma in place of blood and the use of new plasma substitutes such as dextran are given.

To facilitate replacement therapy in anemia, dehydration, acidosis, alkalosis and shock the author has reproduced many charts of other investigators, for example, Gamble, Van Slyke, Collier and Maddock, and also from his own work. Case reports of interest in fluid or electrolyte or protein problems are frequently given with the addition of a simple chart showing daily laboratory and urine tests along with total output and total input. Interesting observations are made on uremia being resistant to treatment before the carbon dioxide is corrected and on loss of fluid from the intestine.

The author assumes some familiarity on the part of the reader with the essentials of electrolyte balance and gives abbreviated formulas for conversion and for diagrams. If the reader is not familiar with the constant acid base equation in the body, he is stim-

ulated to study the subject to determine the source of the figures. In one instance the author has used a chart and formula for the administration of sodium chloride after Collier and Maddock which has since been refuted by these authors. An actual calculation of the milliequivalents of chloride to be replaced on the basis of the blood plasma deficit and the body weight is a safer approach in this instance.

Dr Aalkjaer has made a fine contribution to surgery in this monograph. In addition to the practitioner every teacher of surgery in medical schools or hospitals should read this manual as a possible reference book for his students.

DONALD C. BALFOUR, JR.

IT is probable that relatively few physicians actively engaged in the practice of medicine today have the slightest conception of the travail and racking disappointments endured by our forefathers in attempting to systematize and organize the practice of medicine in the United States. The progress of medical development has lagged at times but it has always gone forward. Unfortunately there are always some physicians who are more concerned with their personal welfare and progress than that of the profession as an organized entity. Nothing in organized medicine is durable or stable unless it unselfishly serves the welfare of mankind. As conditions of life change so must the concepts of organized medicine change, always keeping in the foreground the one salient objective—the preservation and restitution of health. There may be honest differences of opinion as to procedure. One man may be looking and planning far ahead of his time and his intellectual foresight may be extremely acute. Too frequently such an individual is ridiculed and his advice rebuffed. This is one of the unjust penalties that has been suffered by many not only in the medical profession but in all scientific fields. The harmonious organization of the medical profession in the United States has been a tremendous task but it was no greater than the wisdom and efforts expended by the men who brought it about. This fact is well illustrated in *A History of the American Medical Association* by Fishbein.²

For interesting reading this book can be recommended heartily. Organized medicine may be just a bit behind the advance line of scientific medicine yet it has followed medical progress very closely. Of necessity this must be so. It is just to say that organized medicine has never as a body strayed from a true scientific course as so many other organizations have. It has in the past definitely urged reforms and fought for principles deemed necessary to protect

¹ FLUIDS, ELECTROLYTES AND PROTEIN IN SURGERY; ACIDOSIS, ALKALOSIS, DEHYDRATION, CHLOROPNEUMONIA, PNEUMONIA, DYSPEPSIA, ANEMIA. Smock. By V. Aalkjaer, M.D. (Translated by Miss Anne L. Farnhill, M.A.) Copenhagen: Einar Munksgaard, 1947.

² A HISTORY OF THE AMERICAN MEDICAL ASSOCIATION, 1820 TO 1947. By Morris Fishbein, M.D. Philadelphia and London: W. B. Saunders Co., 1947.

human welfare. Repeatedly its demands have been carried to the door of the president of the United States. One cannot escape the question as to whether today the association is as virile and aggressive as it was 50 or more years ago. As early as 1852 the American Medical Association brought to light conditions to which steerage passengers in ocean steamships were subjected and demanded reforms. In 1854 dietary deficiencies in children were studied and an attempt made to correct conditions. In 1883 organized medicine was confronted by antivivisectionists and the situation was met as well as it is today if not better. The first concrete attempt to curtail the sale of July accidents was made by the American Medical Association in 1903. It is a tragedy that the public has insisted on allowing ruthless destruction and maiming of our youth for sport, this in spite of years of admonishment.

Many of our medical forefathers considered honesty and genteel conduct an essential for the practitioner of medicine. In 1902 definite action was taken against fee splitting and solicitation of votes by one seeking office in the society. For many years the code of ethics was of supreme importance and much time was devoted to its development. We still must recognize that honesty in medicine is as important, if not more so than unusual skill and learning.

This volume of approximately 1500 pages is divided into a number of sections. By way of introduction there is incorporated a very interesting sketch of the life of Nathan Smith Davis the father of the American Medical Association. The first section gives data on the formation of the American Medical Association and the high lights of the numerous annual meetings. A section is devoted to the recipients of the distinguished service medal, one to biographies of the 121 president of the association, one to the councils and bureaus of the association and one to publications of the association.

This book not only affords interesting reading but it is a storehouse of information on medical progress and organization. It depicts the characteristics of many men who for at least another century will be revered and honored as the fathers of American medicine.

JOHN A. WOLFE

FIRST published in 1884, *Fyfe's Surgical Handicraft* has progressed with the growth of medicine and surgery through 15 editions. The current edition by 44 contributors in England and Scotland and edited by Hamilton Bailey remains faithful to the endeavors of the original author. It continues to describe the details of surgical work as they appear from the viewpoint of the house surgeon and interne who must ever strive to become a skilled handicraftsman.

The volume is replet with excellent illustrations many in full color and some tinted in part. Unfortunately the selection of colored plates seems to have

been somewhat haphazard rather than to fill a particular need. However on the whole, the presentation of technical procedures is extremely informative and affords an unusual clarity of explanation.

Much of the book is devoted to the hospital or surgical problems which are taken up in a clearly regional manner. There is a slight but understandable lag behind the progress in certain fields, namely in the brief and inadequate references to the therapeutic agents and antiseptics. Such as the chapters on the treatment of burns and the management of surgical thoracic cases have not kept up with advances in these fields.

The American reader may encounter a few familiar terms among the medications and drugs but this is not conspicuous and in no way detracts from the excellence of the text. It is packed with abundance of practical points which will prove great value to the surgical resident, interne, student, and to the practicing surgeon as well. This reviewer recommends this volume most highly.

EDWARD W. Goss

LIKE the modern hotel with a bath in every room *Surface and Radiological Anatomy* continues to improve. The second edition has been necessary to enlarge the text to replace all of the earlier diagrams, and provide surface illustrations. It is prepared for the student who in his dissections, will find it useful to correct knowledge of surface identification with the diagrams which he is investigating. This splendidly illustrated book will also serve radiological and surgical fellows preparing for board examinations.

Far more radiological fundamentals could be added to advantage. Particularly commendable are surface identification of blood vessels, nerves, lymph glands and vessels. The book is obviously students and for those who would refresh their memories later in practice. It is worthy of a large circulation than it will achieve.

EDWARD H. SEDGWICK

THE little book of 120 pages *A Short Handbook of Practical Anæsthetics* by Noel Parry-Pearce is written in refreshingly frank style characteristic of many British writers. It outlines the author's personal experiences and the lessons learned between 1920 and 1945 both in civilian and military practice. It will be found of real value by resident-anesthetists and thoroughly experienced anesthetists will appreciate many of his points of view.

An interesting foreword, written by Mr Cecil G. Wakeley Consulting Surgeon to the Royal Navy

ANATOMY AND RADIOLOGICAL ANATOMY FOR STUDENTS AND CLINICAL PRACTITIONERS. By A. B. Appleton, W. J. Hamilton, and J. C. C. Thompson. Second edition. Edited by A. B. Appleton, M.D. (Cambridge), W. J. Hamilton, M.D. (Oxford), F.R.C.S. (Ed.), and G. Jones, M.D. (Cambridge). Baltimore, The Williams & Wilkins Co. 1944.

A SHORT HANDBOOK OF PRACTICAL ANÆSTHETICS. By Noel Parry-Pearce, M.R.C.S., L.R.C.P., D.A. (R.C.S.). With foreword by Cecil G. Wakeley, F.R.C.S. (Ed.), and John Wright & Sons, Ltd. London: Simpkin, Marshall, Ltd. 1944.

FYFE'S SURGICAL HANDICRAFT: A MANUAL OF SURGICAL MANIPULATION, WITH NUMEROUS AND OTHER MATTER CORRECTED FOR THE WORK OF SURGICAL DISSECTORS, HOUSE SURGEONS, AND PRACTITIONERS. Edited by Hamilton Bailey, F.R.C.S. (Ed.). 15th ed. Baltimore: The Williams & Wilkins Co. 1947.



Fig. 2. Mobilization and conversion of multiflocular hernial sac. Femoral locule inguinalized.

5 *Multiple interfascicular defects with fascial incompetency* One explanation offered for diverticular herniation is the sparsity of widely separated fasciculi of the internal oblique muscle and the coexisting interfascicular spaces in the middle aponeurotic stratum. If the spaces are large and the investing fascia bridging them velamentous, they become potential exits through which a hernia may protrude. Subperitoneal adipose tissue or a locule arising from the direct component of the sac may force itself through these vulnerable areas. Since diverticular hernias are prone to occur in the cranial portion of the wall they have been referred to as ventral inguinal hernias. However diverticular hernias should be distinguished from spontaneous ventral hernias (Zimmerman et al.) and hernias of the linea semilunaris (Spigelius).

Particularly the fascia transversalis frequently shares in the partial agenesis of the internal oblique muscle. Although Bassini, Halsted, Ferguson, and others (4, 5, 21, 26, 35) recognized this associated weakness they were more concerned with the potential weakness in the medial portion of the canal. The substitution of like generic tissue for the inadequate or missing stratum has long been recognized as fundamentally sound but there



Fig. 3. Mobilization and conversion of multiflocular hernial sac. Direct and femoral locules, indirectized. 1 iliopectineal ligament, 2, inguinal ligament, 3 femoral ring, 4 internal ring, 5, hernial sac; (a) indirect locule, (b) direct locule, (c) femoral locule, and 6 epigastric vessels.

is lack of unanimity as to the best technique in accomplishing it.

(a) The reflection of the anterior rectus sheath (Woelfer, Bloodgood, Halsted (16), and Estes) and transfixation of its edge to the inguinal ligament was the favored technique for many years. Similarly the rectus flap has been sutured to Cooper's ligament. The objection to this type of maneuver is that a spindle shaped weakness is created between the rectus muscle and the medial margin of the flap as only a thin posterior rectus fascia with no appreciable strength is left. When the fascial defect is narrow the rectus sheath can be incised medially; this allows the sheath to separate but the gap is protected by the underlying rectus muscle. The sliding graft of Falis and Tanner obviates the criticism of the reflected flap.

(b) The patch graft of Kirschner, Singleton and Stehouwer taken from fascia lata, and full thickness skin grafts of Mair have been used with varying results.

(c) A massive pedicled graft of the iliotibial tract, as advocated by DeGaray and Wangen

contains the sentence "To my mind the anaesthetist is just as much a specialist as the surgeon and should

be rated as such. Surgeons in the United States might well consider this an authoritative statement

RALPH M. TOVELL.

BOOKS RECEIVED

Books received are acknowledged in this department, and such acknowledgment must be regarded as a sufficient return for the courtesy of the sender. Selections will be made for review in the interests of our readers and as space permits.

CALCIFIC DISEASE OF THE AORTIC VALVE. A COMPREHENSIVE ANALYTIC SURVEY OF CALCIFIC SCLEROSIS. By Howard T. Kainer, M.D., and Simon Koletsky, M.D. Philadelphia, London, Montreal: J. B. Lippincott Co., 1947.

PRACTICAL OBSTETRICS. By Bruce T. Mayes, M.V.O. M.B., B.S. (Sydney), F.R.C.S. (Edin.), F.R.A.C.S., F.R.C.O.G. Sydney: The Australasian Publishing Co. Pty. Ltd. 1947.

TEXTBOOK OF THE NERVOUS SYSTEM, A FOUNDATION FOR CLINICAL NEUROLOGY. By H. Chandler Elliott, M.A., Ph.D. Philadelphia, London, Montreal: J. B. Lippincott Co., 1947.

ESSENTIALS OF PHARMACOLOGY. By Frances K. Oldham, M.Sc., Ph.D., F.E. Kelsey, Ph.D., and E. M. E. Geiling, Ph.D., M.D. Philadelphia, London, Montreal: J. B. Lippincott Co., 1947.

ENDOCRINOUS ENDOCRINOTHERAPY INCLUDING THE CURATIVE CURE OF CANCER. COMPENDIUM. By Dr. Jules Semmel. Amsterdam: Holdert & Co., 1947.

PROBLEMS OF EARLY INFANCY. Transactions of the First Conference, March 3-4, 1947. New York: Josiah Macy Jr. Foundation, 1947.

COMMUNICABLE DISEASES. By Franklin H. Top, A.B. M.D., M.P.H., F.A.C.P. and Collaborators. 2nd ed. St. Louis: The C. V. Mosby Co., 1947.

SYNOPSIS OF OBSTETRICS. By Jennings C. Litsenberg, B.Sc., M.D., F.A.C.S. 3rd ed. St. Louis: The C. V. Mosby Co., 1947.

TRATADO PRACTICO DE HEMOTERAPIA. By Dr. Emilio S. Sammartino. Buenos Aires: Varequez, 1947.

CIRUGIA. By Rafael Utrera, C.C. Santiago: Chile Editorial Teguakda, 1947.

THE PRACTICAL NURSE. By Dorothy Deming, R.N. New York: The Commonwealth Fund, 1947.

GEORGE CRILE, AN AUTOBIOGRAPHY. Edited, with Side-lights, by Grace Crile. In two volumes. Philadelphia and New York: J. B. Lippincott Co., 1947.

ILLUSTRATIONS OF REGIONAL ANATOMY. By E. B. Jamieson, M.D. 7th ed. Section I: Central Nervous System; Section II: Head and Neck; Section III: Abdomen; Section IV: Pelvis; Section V: Thorax; Section VI: Upper Limb; Section VII: Lower Limb. Baltimore: The Williams and Wilkins Co., 1947.

PHYSICAL MEDICINE IN GENERAL PRACTICE. By William Bierman, M.D., with a chapter on Medical Rehabilitation by Sidney Licht, M.D. 2nd ed. New York, London: Paul B. Hoeber Inc., 1947.

ARTIFICIAL PNEUMOTHORAX IN PULMONARY TUBERCULOSIS. By T. G. Heston, M.B. (Tor.) 2nd ed. Toronto: The MacMillan Co. of Canada, Ltd., 1947.

ENGLISH-SPANISH CHEMICAL AND MEDICAL DICTIONARY COMPRISING TERMS EMPLOYED IN MEDICINE, SURGERY, DENTISTRY, VETERINARY BIOCHEMISTRY, BIOLOGY, PHARMACY, ALLIED SCIENCES AND RELATED SCIENTIFIC EQUIPMENT. By Morris Goldberg. 1st ed. New York, London: McGraw-Hill Book Co. Inc., 1947.

CORRESPONDENCE

PLASMA CLOT GRAFT OF PERITONEUM FOR PERFORATION OF THE STOMACH

To the Editor: In answer to the comments of Dr Amos Koontz, concerning my article entitled "Plasma Clot Graft of Peritoneum for Perforation of the Stomach," which appeared in the August, 1947 issue of *Surgery, Gynecology and Obstetrics*, I wish to reiterate first that the method described in my article is purely an experimental one. Second, I believe that it is the first time anyone has succeeded in closing a gastric perforation by an adhesive method entirely without the use of sutures. This method was devised only in the hope that it could help in a special type of gastric perforation, not the routine small perforation. In explaining the success of the last 4 of a series of 9 experimental animals, the technique of applying the graft was extremely important because it also included a method of at least temporarily controlling the digestive action of gastric juice. The work of Virginia Franta, as well as that of many others, amply demonstrated the local effect of oxyel when implanted in the body tissues. Since oxyel is an acid it is my belief that it served as a temporary block against the digestive action of gastric juice just as gastric mucus does. The varying degrees of success met with, since the work of Neuhof in 1917 and Koontz in 1939 proved that a perforated hollow viscus under proper conditions could be closed with a suture patch successfully. Neuhof's method of autogenous fascial grafting and Koontz's method of ox fascia grafting were both suture methods. My method differs from both in that it is nonsuture method but is similar to Neuhof's method since it is an autogenous method using fascia-peritoneum for the posterior rectus sheath of the same experimental animal. No one denies the fact that the acidity of gastric juice is an important factor in its digestive action on tissue, other than gastric mucosa. This has been amply proved by Price and Lee. But one must recognize the fact that fascia is one of the most resistant to this action. It was thought that if a combination of factors could be developed to delay the unusual digestive action of gastric juice enough to permit the growth of gastric mucosa across the site of perforation the perforation might heal.

The healing that resulted was similar to that of those successful cases of suture patch grafting of Neuhof and Koontz. However, suture methods are not applicable in large perforations with widespread

induration. In a series of 9 dogs all were treated alike, before and after operation. Those with perforations that were sealed tightly by means of the oxyel plug, fascia peritoneum graft and pressure clamps were able to eat as soon as they recovered from their anesthetic.

Perhaps I may be able to indulge in a bit of self criticism in that no preoperative and postoperative gastric analyses were made. However this was given considerable thought before beginning the experiment and abandoned. It was felt that, first, one had to prove that a nonsuture adhesive method could be used successfully in conditions approaching the normal, before an attempt is made to apply the method to the abnormal.

In the next series of experiments, we shall attempt to make closure on animals with Mann-Williamson ulcers that have been made to perforate with histamine in beerwax.

It is thought that oxyel, whose chemical name is polyanhydroglucuronic acid, blocks gastric acidity and therefore it has been used as a plug in the experiment.

Neuhof and Koontz in some of their experimental animals performed some form of short circuit operation at the time of grafting to control the hyperacidity. Koontz even inserted bismuth substrate into the stomach of some of his animals. Both methods appeared to aid in successful grafting by suture methods. Others have attempted the use of continuous gastric suction to successful conclusions.

By accentuating the mechanical technique involved in my method the acidity of gastric juice was kept in mind the use of oxyel as described being thought to block this activity.

Unlike Koontz a patch of ox fascia, Franta and others have demonstrated that no local tissue reaction results from the use of oxyel. It has been shown that at the site of implantation of oxyel, multilocular nodules form surrounded by a coagulated tissue membrane. As the oxyel becomes lysed and absorbed the coagulation is surrounded by a zone of fibroblasts and invading large monocytes. Absorption is usually followed by connective tissue scar formation. It is quite noticeable at the time of implantation of the oxyel plug that, as it becomes moist, it swells thus filling the entire cavity at the site of perforation quite snugly.

Dr Koontz, in his comment stated, "If the implant does remain intact however the ultimate result is excellent. With this remark he helps to answer his own question. I believe that my successful experiments were due to the fact that my implants were placed in such a manner that they were able to remain intact and thus successfully produce healing of the perforation."

JOSEPH BLOOM.

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steen, is a more formidable procedure but it is ideally suited to those cases with marked combined deficiency of the wall, and may be used when recurrences have followed other methods of repair.

Apart from the intrinsic causative factors of herniation, there are collateral or extrinsic factors which, if considered casually may seem remotely related. I refer to systemic maladies such as asthma and chronic bronchitis, and to biologically inferior individuals. The surgeon, therefore, should possess not only the necessary anatomical and technical knowledge to treat hernia but also the ability to recognize the structural pattern, clinical habits, and occupational requirements of the patient. Only by correlation of all factors, anatomical and constitutional, will we be able to come nearer to attaining our goal in herniology.

CONCLUSIONS

1. Reasons for the lack of general acceptance of Cooper's ligament hernioplasty have been enumerated.

2. The anatomical features and relationships of Cooper's ligament have been discussed and illustrated, and its strategic advantages in hernial repair have been pointed out. Similarly its points of vulnerability and its technical hazards have been presented.

3. The criteria for guidance in the employment of Cooper's ligament have been proposed.

4. Efforts have been directed toward dispelling certain technical as well as morphologic misconceptions in regard to the sacular classification of hernias.

5. The dictum of digital exploration and consecutive removal of all variants of the sac, inguinalizing the femoral locale, and indirectizing the other coexisting locules, is reaffirmed as being fundamentally important in the surgical treatment of hernia.

6. The correlation of the sacular and mural factors is essential in selecting the technique that offers the greatest assurance of a cure of the type of hernia at hand.

7. Certain extrinsic factors, including systemic maladies, the constitutional habits, and the occupational requirement of the individual, should be evaluated before the selection of the most suitable repair and these factors should play a role in the timeto prognosis.

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COLLECTIVE REVIEW

THE PRESENT STATUS OF ARTIFICIAL INSEMINATION

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ARTICLES dealing with considerations of the so-called test tube baby have aroused great interest in the minds of the lay public recently. It would seem that there is something of the dramatic if not of the lurid, in the discussion of artificial insemination. Following a review of some of the recent literature, and as a result of a small number of artificial inseminations carried out, an attempt to re-evaluate the position of artificial insemination in the treatment of sterility seems appropriate.

It is imperative to differentiate between homologous and heterologous artificial insemination as designated by Israel. The former term refers to insemination of a wife with her husband's semen while the latter connotes the use of donor semen. The indications, techniques and medicolegal aspects of the two procedures are entirely different and it is obvious that heterologous artificial insemination carries with it certain moral and psychological implications which are wholly absent when the husband's semen is used.

From the literature and from personal communications it is evident that there are extremely diversified feelings among physicians relative to participation in the practice of heterologous artificial insemination because of the moral and legal implications. In view of the increased interest in artificial insemination during the last few years one is impressed with the need for accurate legal and theological expression. It is imperative that any consideration of the practical aspects of the procedure must include these implications.

Before proceeding to further discussion of these matters it seems propitious to present the indications and techniques of artificial insemination from a purely medical viewpoint.

INDICATIONS

Heterologous. The indications for the employment of heterologous artificial insemination in the treatment of infertility seem relatively clear. Simply they consist of the established sterility of the husband and the apparent fertility of the wife. The procedure should be reserved for couples in which the husband approaches absolute sterility. The line between absolute sterility and relative infertility is difficult to draw and of course in the evaluation of any given case it must be established arbitrarily. There are cases on record in which fecundation had occurred when the sperm count had been 19,000,000 per cubic centimeter or less (311). Cary reports marital pregnancies in two couples 1 and 3 years, respectively after delivery of a child conceived as the result of heterologous artificial insemination. If a husband is thought to be potentially fertile consideration of donor semen should be abandoned and with urologic consultation fertility should be promoted if possible, to the degree where intramarital impregnation is feasible. Such efforts are certainly warranted and in these cases the use of donor semen seems unwise. Conservatism in borderline cases surely should be the rule. It goes without saying that satisfactory general and pelvic health of the wife should be included among the indications for heterologous artificial insemination.

Other indications for the use of heterologous artificial insemination have appeared in the lit

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erature. Halbrecht has employed the procedure in cases of habitual abortion. Gierke's disease and night blindness. Potter and Willson have reported a case in which heterologous artificial insemination from an Rh negative donor resulted in the birth of a normal child to a mother who had previously had erythroblastotic twins. A large number of constitutional or mental diseases, if present in the husband, might also be considered indications for heterologous artificial insemination. It is obvious that such indications are based upon the inadvisability rather than the inability of the husband to foster a child. Such elements of personal opinion and evaluation and decisions are necessarily weighted more with the should be made with considerable caution. I doubt that we as doctors, have the right to deliberately deny a husband the right of fatherhood, and decide that heterologous artificial insemination of his wife is indicated, even though from the standpoint of pure eugenics such a course might at times be advantageous.

Homologous. While there is little disagreement relative to the medical indications for heterologous artificial insemination, there is by no means a comparable unanimity of opinion concerning the indications for artificial insemination by use of the husband's semen.

Cary states that the indications for the injection of the husband's specimen into the uterine cavity for the relief of sterility are relatively rare. He states that the inability of sperm cells to migrate to the cavity of the uterus because of weakness of the specimen or chemical or mechanical obstruction of the cervical canal constitutes the general indication for the procedure. Cary feels wholly unprepared to fix the standard criteria of semen defects which may justify or contraindicate the procedure.

Guttmacher makes the pertinent comment that if the spermatozoa are so pathologic that they need a 3 inch boost on their 6 inch journey they probably will be sterile anyway when face to face with a fertile egg. Guttmacher divides the indications for artificial insemination into three groups. One group considers the sterile husband and in this group a donor's semen is indicated. A second group includes the cases in which intravaginal coitus is mechanically impossible. The third group includes an "all inclusive" group of conditions which represents a composite from the works of Schorohaw, Schultze, and Cary. Listed among this all inclusive group are ante flexion, retroflexion, conical cervix, hypoplasia of the uterus, relaxed perineal body, salpingo-oophoritis, endometritis, enlarged uterus, cer-

vical stenosis, or endocervicitis and subnormal semen. There is considerable difference of opinion as to the therapeutic value of the procedure in these conditions. Guttmacher expresses an overwhelming skepticism of the value of artificial insemination in the treatment of ordinary sterility and indeed it is difficult to understand how any advantage might accrue from the procedure in the presence of many of the conditions listed. There can be little doubt of the value of homologous artificial insemination in cases of hypoplasia, coitus is impossible because of by postadial impotence, vaginismus, tumors, or obesity.

There are several accounts in the literature in which sterility of unknown cause" has constituted an indication for homologous artificial insemination. The latest of these appears in the September 1946 issue of *Illnesses Fertility* by L. Halbrecht. His results along with those of others have not been gratifying. To employ homologous artificial insemination in such cases is to grasp at a last straw in a vein of wishful thinking as such treatment is not predicated on any scientific rationale.

Greenhill gives two reasons only for homologous artificial insemination. They are (1) the inability of the husband to deposit semen within the vagina and (2) the inability of the spermatozoa to gain access from the vagina or external os to the uterine cavity. Along these same lines Meeker has defined the indications as two and two only: a persistent fault of delivery-reception and an incorrigible hostility of the endocervical secretions.

The logic of Greenhill's and Meeker's contentions seems clear. Summarily perhaps the indications for homologous artificial insemination may best be defined as those conditions which prevent the sperm from (1) gaining access to the external os of the cervix, and (2) passing through the cervix to the uterine cavity.

Included among the indications in the first group are hypoplasia, vaginismus, severe dyspareunia, impotence, premature ejaculation, tumors, obesity and severe malpositions of the uterus such as severe retroversion. The second group consists of conditions in which the cervical secretions remain hostile in spite of persistent attempts to correct them.

A good deal has been written relative to hostile secretions of the cervix. Weisman, in studying spermigration in female secretions, lists four types of cervical hostility: mechanical, bacteriologic, chemical, and serologic. On close study of the four types there appears to be considerable

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overlapping infection with its impaired drainage is the keynote and the production of an infected viscid mechanically obstructing mucous plug with a lowering of the pH tends to make the endocervix hostile to the upward migration of spermatozoa. The question of serologic hostility is a separate and interesting consideration. From some personal observations recently made it would seem unlikely that hostility of the cervical secretions is due to serologic incompatibility.

Whatever the composite basis for its hostility of the secretions exists as a real factor in the prevention of sperm migration. Huehner's test was devised to detect such incompatibilities between the spermatozoa and cervical secretions and as such should be helpful in anticipating which cases might be appropriate for the employment of homologous artificial insemination. Such insemination is indicated in the presence of an unsatisfactory Huehner test only after every effort has been made to rectify cervical pathology and to improve the cervical secretions. As always, the primary effort should be directed toward treating any apparent cause for infertility rather than toward resorting to artificial insemination to effect conception in the face of pathology.

TECHNIQUE

Heterologous Perhaps a discussion of the details of the mechanical transfer of seminal fluid should be prefaced by a word of caution relative to the careful selection of patients. It has been emphasized by Guttacher that heterologous artificial insemination should never become an assembly line procedure but that it should be reserved for couples who qualify for this somewhat radical procedure only after close evaluation. Such evaluation is obviously difficult in many instances in which a patient and her husband pay only one or two preliminary visits to the office prior to the insemination. It is imperative that the physician attempt to learn everything possible about the couple and their feeling toward the procedure. Heterologous artificial insemination should never be urged upon anyone and should only be considered when both the husband and wife solicit the services of the physician with real sincerity. If there is any evidence of reluctance or indifference on the part of either partner the procedure should be abandoned. The decision of a couple to subject the wife to artificial insemination with donor's semen should be predicated upon a thorough knowledge of the procedure in all its implications. It is within the physician's province to acquaint prospective couples with these aspects in much the manner in which they

appear in this article. A continued desire to proceed, after full realization of all the ramifications of the procedure, should testify to the couple's sincerity of intent, and should qualify them among the carefully selected group.

Even though patients are carefully selected, I believe, unlike Guttacher that signed papers are necessary for the protection of the physician. Both the husband and wife should sign such a paper which expresses their desire for the physician's services relative to the procedure and which absolves him from any responsibility concerning complications which may arise from it. Legal documents should be drawn up with the aid of counsel and should be considered only as protection for the physician. Such papers should be kept in a private vault and not with other accessible office records.

The selection of the donor should likewise be undertaken with care and only by the physician. Prearrangement whereby a blood relative serves as the donor is fraught with potential emotional hazard and possible social and legal repercussions. Complete anonymity is imperative. Consequently the selection of the donor is entirely the physician's responsibility. Barton and others have given a detailed account of the various factors which they deem important in the careful selection of donors. Included by them among the requirements for selecting the donor are (1) he should have at least two children of his own, (2) he must be of mature age so that his character and reliability can be assured and (3) his sperm count must be over 30 million.

In our own small series of cases, we have used as donors the members of the house staff of two university affiliated hospitals or students from the medical school doing senior hospital work. Such individuals have been unmarried in most instances and this lack of family has not appeared as a disadvantage especially in view of the anonymity of the procedure. Under such conditions the lack of an available object for the parental drive seems of lesser importance. Such donors are for the most part of a younger age group than that felt to be advantageous as these workers have confessedly stated that one of their chief difficulties lies in the fact that most mature men have low fecundity. I wonder if the younger in-tern group might not offer more advantage insofar as higher fertility is concerned. Surely an intern has begun to manifest enough evidence of character so that his value as a potential donor can be determined. The arbitrary standard of 30 million sperm per cubic centimeter seems low in

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considering that we have free reign in the donor selection. Perhaps twice or three times this sperm count would be more appropriate as a minimum. Every effort should be made to select donors who enjoy excellent health and in whom the family history is satisfactory. Physical and racial similarity to the husband should be observed. The use of specimens from more than one donor or the use of a donor "pool" would increase the anonymity of the procedure and perhaps warrants a trial. If the wife is found to be Rh negative an Rh negative donor should be used. One donor is capable of siring a great many children and if anonymity is maintained it is feasible that they may become numerous in any given community without knowledge of the fact. Intermarriage is at least a theoretical possibility and such a danger should restrict the use of a single donor to a small number of cases.

COLLECTION AND TRANSFER OF SEMINAL FLUID

The collection and transfer of seminal fluid should be carried out in such a way as to approximate as closely as possible the physiology of normal intercourse. Such procedure is simple of execution. The specimen is collected in a clean glass preferably by masturbation. Although there may be some psychological or moral disadvantage inherent in this method, the cleanliness of collecting the specimen, the definite control of time factor and the convenience to all parties concerned make it most practical. Much has been written relative to the duration of viability of normal sperm. There is no question that specimens will remain potentially fertile for several hours and perhaps much longer if they are kept cool. However there is no need for delay in making the transfer. Nature does it directly and a lack of homogeneity of the specimen does not present a contraindication to the physician's attempt to simulate nature. It is not impractical to have the patient prepared prior to the collection of the specimen.

There have been variations described in the technique of injecting the seminal fluid. It is essential to realize that we are dealing with determined normal and with a woman of proven fertility insofar as such a factor can be evaluated. Consequently all that is essential is to deposit the semen upon the external os in as simple a manner as possible. This is best done by placing the patient in lithotomy position and exposing the cervix with a speculum. The entire ejaculate is drawn into a clean 5 to cubic centimeter syringe with Luer adaptor and is expressed onto the external os of the cervix. There

is no indication for intrauterine or intracervical insemination. Such a procedure is unphysiological and carries no inherent advantage. The patient is kept in the dorsal position with hips elevated for from 20 to 30 minutes and then allowed to leave. Cary has performed the insemination with the patient in Sim's position and then kept her in the dorsal position for the ensuing half hour. Halbrecht says that his patients sit quietly for 10 or 15 minutes and are not required to lie down. Preliminary douches of fortified Ringer's solution as described by Hotchkiss and MacLeod, or of 10 per cent glucose or alkaline solution as used by Halbrecht are of unproved value in heterosexual artificial insemination. The latter author states that such douches did not affect his results.

It is apparent that if the procedure is to meet with success it must be carried out during the fertile portion of the menstrual cycle. All adjuncts to the determination of the time of ovulation are of value. Studies of the cervical mucus, vaginal smear, biopsies, occurrence of ovulatory midcycle pain, and recordings of basal temperature are all helpful. In general it may be said that the most likely time for artificial insemination is on the fourteenth day prior to the onset of the subsequent menstrual period. If 3 trials are carried out each month at a day intervals with the second trial falling on the optimal date, the chance for success is excellent.

There is, of course, no way to anticipate how many efforts may be required to effect conception in any given case. Success is in part a matter of chance just as it is in normal fertile marriages. It is well to explain to prospective patients and donors that repeated efforts may be necessary. They may become discouraged if pregnancy is not promptly achieved. There have been cases reported in which success followed only after months and even years of effort. If after 3 months the donor is changed, conception has not occurred or 9 inseminations have been attempted, the donor fee has been arbitrarily established at twenty-five dollars the first month and ten dollars the second and third months, a total of forty five dollars for 9 specimens, if 9 are needed.

In brief, the technique of heterosexual artificial insemination should be made as simple as possible and should attempt to reproduce the process of normal intercourse. Incidentally the donor fee should be established at twenty-five dollars for 9 specimens, if 9 are needed.

Homologous The semen specimens for insemination from husband to wife are collected by coital intercourse, coitus interruptus, or coitus, and preferably from a practical standpoint, by

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turbation. Prompt transfer of the specimen byotomy and slight Trendelenburg position of the patient, exposure of the cervix, and selection of the optimum period of the month are all carried out as described under heterologous artificial insemination. When the indication for artificial insemination from husband to wife is because of faulty delivery of the sperm to the external os, for one or more reasons as given under indications, the transfer is made directly to the external os as described for the use of donor semen. Once more efforts should be directed toward reproducing the physiology of normal intercourse. Barton and others have allowed the wife to practice self insemination in cases in which impotence, dyspareunia or ejaculatory failure were the indications. Such inseminations were of course intravaginal. It seems that the procedure would be better controlled by the physician with the cervix under direct vision and the patient in lithotomy position.

However it is the group in which hostile cervical secretions represent the indication in which there is definite difference of opinion relative to the detail of technique. Guttmacher and Cary advocate intrauterine insemination in this group. Cary warns that not more than 0.6 cubic centimeter of semen is used so as to avoid getting it into the tubes or abdominal cavity where colic or possibly inflammatory reaction may occur. Barton and her coworkers have placed the cannula from $1/4$ to $1/3$ inch into the cervix in cases of defective cervical invasion and have very carefully injected a small quantity of semen. They caution against forceful injection as recommended by Guttmacher and others because of the danger of getting semen into the endometrial cavity. Israel points out the fact that the irritating effect of semen may institute uterine contractions which tend to prevent the upward migration of spermatozoa. The menstruallike cramps occurring immediately after occasional intracervical inseminations in which some semen may have entered the uterus, lends credence to Israel's contention. Halbrecht (10) has abandoned the intrauterine method because it was not without harm and required cervical dilatation. Intrauterine artificial insemination seems to be the most logical of these cases. In intrauterine insemination, as described by the Germans, the patient is hospitalized, taken to the operating room, and is semiconscious under sterile conditions with a catheter in the uterine cavity however this method seems to offer no advantage and is fraught with potential hazard. Even under favorable circumstances semen cannot be considered sterile

Bickers reports a case in which a pelvic abscess developed following an insemination in which some fluid entered the uterine cavity and points out the danger of uterine insemination because of the fact that semen is not sterile. Franz has reported a case of fatal sepsis which followed intrauterine technique.

Guttmacher has reported that he has been working on the so-called spreading factor of Schwenk and Tislowitz. It is a testicular enzyme which dissolves mucus and has been applied to the cervix prior to artificial insemination. Any benefit therefrom remains unestablished. Guttmacher also comments on the fact that only 1 conception has followed insemination by material aspirated from the testis and points out the uselessness of this procedure.

RESULTS

It is exceedingly difficult to evaluate the results of artificial insemination subsequent to a review of the literature. The indications for the procedure in the hands of different authors are quite varied and are often not clearly given. There is commonly no definite differentiation between heterologous or homologous types, especially among the early writers. The technique has been as varied as the indications, sometimes being described as intrauterine, sometimes as intracervical, and sometimes as intravaginal. The number of inseminations each month as well as the number of cycles through which efforts have been maintained differ among various authors. With so many variables, statistics are difficult of interpretation.

Among the early reports is one of Schorohowa which lists 88 cases with 33 successes there is a paucity of detail reported. Seguy reported on two series. The first consisted of a total of 24 treatments to a few women with no success. The second included 16 cases, among which there were 7 unsuccessful results. A donor specimen was used in 2 cases. Schultze achieved 15 successes among 102 cases.

If the more dependable results of the recent works of Cary, Israel, Guttmacher, Halbrecht, and Barton are grouped together we find 87 successes among 174 attempts at heterologous artificial insemination and 17 successes among 119 attempts at homologous artificial insemination. The ratios are seen to be exactly 1 to 2 and 1 to 7 respectively. It is interesting to note that among the attempts at homologous artificial insemination reported by Halbrecht and Guttmacher there was a total of 65 cases in which the indication was infertility of unknown

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cause. There was only 1 success in this entire group. The remaining 16 successes reported by all 5 authors were achieved in cases in which the indication was abnormal spermiation, impotence, hypospadias, or cervical obstruction.

The small group of cases accumulated by the author correlates well with the over-all summary of the work described. There have been 7 patients in whom heterologous artificial insemination was employed. In 1 the procedure succeeded twice and in 3 others, once. There have been 3 failures in 8 attempts. The patient in whom there were 2 successes became pregnant in whom instances after only 1 month's effort consisting of 3 inseminations. One patient was successfully impregnated after 2 months of such effort 1 after 6 months, and 1 after 14 months. One of the 3 patients in whom failure occurred disappeared after 7 months and the 2 others, both of whom live out of the city temporarily discontinued the inseminations after 6 months. They both plan to resume efforts. The indication for use of donor semen was either severe oligospermia or azoospermia in every instance. In the 5 successes, 2 normal deliveries ensued and 3 patients are currently carrying the pregnancy.

There have been 8 cases in which the author has used the husband's semen. Seven of these have been couples who had no demonstrable cause for infertility. In none of these cases has pregnancy ensued. It is the lack of success in this group both in this small series and in others reported which has led to the feeling that homologous artificial insemination is helpful in only very special and limited conditions as outlined under the indications. In the eighth case in which homologous artificial insemination was used the result was successful and a normal infant was subsequently delivered. The indication was severe retroversion of the uterus, and marked, persistent cervicitis with an unsatisfactory Huhner test.

Seymour and Koerner in 1941 published an article purporting to describe the results of artificial insemination in the United States as reported by 7,642 physicians in answer to a circular which was sent to 30,000 physicians who might be in a position to do artificial inseminations because of the nature of their practices. These reports included some very remarkable statements. It was concluded that nearly 10,000 pregnancies had been achieved through artificial insemination, two-thirds of these with the husband's semen. The proportion of boys to girls was 8 to 5 when the husband's semen was used and 7 to 5 when a donor's semen was employed.

Ninety-seven per cent of all successful inseminations resulted in live babies. The incidence of stillbirths was practically negligible and the incidences of ectopic pregnancy and miscarriage were one-sixth and one-fifth, respectively, of the figures usually given as normal. All living children were born normal in every respect. It is estimated that nearly 400 surgical operations were prevented because of the use of artificial insemination.

It is little wonder that Folsome expressed criticism of this survey in the light of such startling conclusions. His feeling that "perhaps man can populate more efficiently and with greater fetal salvage quantitatively and with greater biological congress is easy to understand if one is to accept the figures given. The results of such a survey necessarily poorly controlled and without documentary evidence should be received with great caution. It is not wiser to study closely the individual reports in the literature which represent the efforts of workers in the field who have made a detailed investigation of artificial insemination in all its aspects?"

LEGAL ASPECTS

Heterologous: The medicolegal aspects of heterologous artificial insemination are woefully ill defined. There have been few articles in the literature relative to the legalities involved. It is obvious that the paucity of expression stems from the fact that the procedure with all its implications has never been presented to a court of competent jurisdiction in this country for determination. Consequently there has been no judicial expression on the issues involving the procedure. Such issues might be properly divided into problems particularly concerning (1) the child, (2) the wife and her husband, (3) the donor (4) the physician, and (5) the procedure as a whole.

As to the child, on May 6, 1939 an editorial appeared in the Journal of the American Medical Association entitled, "Artificial Insemination and Illegitimacy" (4). This editorial revealed that the presumption of law that a child is legitimate when born during wedlock is not conclusive and can be overcome today when proof is offered that the mother's husband cannot be its father. If in artificial insemination a donor's semen is used, the child would seem to be illegitimate. The fact that the husband has given his consent to the procedure has no bearing on the child's legitimacy. Unless the husband adopts such a child it remains a bastard issue and as such cannot acquire in-

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It has been stated by one legal authority that society has evolved certain concepts as to immorality and illegality with respect to bastard issue because of conditions under which it comes into being and the dangers it fosters to the community and to the offended husband. Such an analogy does not exist with respect to the issue resulting from heterologous artificial insemination. Whether the court would entertain a similar interpretation remains among the undecided problems.

The chief problem concerning the wife and her husband is that of adultery. Although as stated above there has been no determination of this problem by the courts in this country it is interesting to note in this connection the decision of the Supreme Court of Ontario in a case involving heterologous artificial insemination performed in England on a married woman whose husband was in Toronto. This decision rendered in 1921 intimated very strongly that a married woman who submits to an artificial insemination the donor being a man other than her husband commits adultery. In this case the husband had no knowledge of the procedure.

However it seems that adultery as defined in common law or statute contemplates sexual intercourse. This of course is not true of a woman submitting to heterologous artificial insemination. Whether or not such a procedure might be interpreted as adultery in present day courts in this country remains undetermined.

The donor probably has no legal liability with respect to the procedure although if he misrepresents his heredity or his physical condition it is conceivable that a liability might accrue. It is also possible that further legal issues might arise because of the fact that the donor is married.

As to the physician there is first of all the question of legal protection in the form of written consent to the procedure. This should obviate any future action by the husband or wife against the physician. The nature and limits of the physician's responsibility in selecting the donor are among the problems not yet determined by law or defined by the courts.

As to the procedure as a whole the Bureau of Legal Medicine and Legislation for the American Medical Association has made the following comment in an unpublished communication in response to a query.

It has been argued that public morals are necessarily injured by attempted assignments of sex rights and prerogatives and by the willful production of bastard issue that every child of strange or questionable paternity is a reproach to morality that any procedure which produces an illegitimate is in itself necessarily illegal that the procedure nullifies the legislative intent concerning sexual monopoly between husbands and wives and that the procedure itself tends to the degradation of the resulting child. For these reasons it has been argued that all participants in the procedure the physician the patient, the husband and the donor might be guilty of violating a statute common in most states making it a criminal offense for two or more persons to conspire to do any illegal act injurious to public morals.

The bureau then attempts to refute the above arguments. It is pointed out that heterologous artificial insemination is not an assignment of sex rights. There is no consent to intercourse by a third party nor to any other rights the husband has in his wife. The procedure is scientifically and privately done. Because society has not yet had time to evolve any opinion as to the morality of the procedure, such procedure can hardly be called immoral. And inasmuch as there is no law which would apply to the matter either written or unwritten, there can be no decision as to the legality of it.

There is still another point of confusion incident to the legal interpretation of signed contracts purporting to the adoption of the unborn child. Even though the husband has consented in writing to adoption of his wife it is problematical that a court of chancery would uphold such a contract for specific performance in the event that the husband changes his mind for one reason or another after the child is born.

These problems have been enumerated as evidence of the multiplicity of legal issues, all of which are incident to heterologous artificial insemination and which are unanswered in the light of competent court decisions. The views expressed represent the opinions of the Bureau of Legal Medicine and Legislation of the American Medical Association. They are confessedly offered as personal opinions in the absence of judicial precedent.

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These problems have been enumerated as evidence of the multiplicity of legal issues all of which are incident to heterologous artificial insemination and which are unanswered in the light of competent court decisions. Some of the views expressed represent the opinions of the Bureau of Legal Medicine and Legislation of the American Medical Association. They are confidentially offered as personal opinions in the absence of judicial precedent.

It has been stated or inferred often in the literature that it is extremely difficult to evaluate the morality or legality of heterologous artificial insemination because of the novelty of the procedure. When one considers and realizes that the number of cases in which the procedure has been done must now be expressed in thousands, it is difficult to reconcile novelty with the inadequacies of the legal machinery governing heterologous artificial insemination. It is perfectly obvious that all the legal opinions relative to the procedure are struggling to interpret it within the boundaries of ancient statutes and common law dealing with illegitimacy and adultery. At the time such laws were formulated artificial insemination had not made its necessarily but unfortunately surreptitious entrance into medical practice and literature. Consequently they were never meant to encompass all the implications of the procedure.

In a paper given before the Interstate Postgraduate Medical Assembly of North America in 1943 (8) Guttmacher makes the rather startling recommendation that hospital records and birth certificates be falsified in the event that the physician delivers the child begotten as the result of heterologous artificial insemination he has done. No one will question either the sincerity of purpose or the illegality of such a recommendation.

Again in their article on artificial insemination, which appeared in the *British Medical Journal* in January 1945 Barton, Walker and Weisner (1) state that couples are informed that the child will be legitimate if the husband is registered as the father. In their hands such registration is demanded although they realize it constitutes an offense.

Here then are examples of reputable physicians recommending or demanding the execution of illegal acts in good faith because they feel that by so doing they can render their patients a real medical service. Even the most conservative must acknowledge that in selected instances a genuine medical service is rendered to barren couples by the use of heterologous artificial insemination. If the patient is referred for delivery to an obstetrician who is unaware of the artificial insemination no deliberate execution of illegal acts is committed. This is a partial solution to the problem. There is a need for legal recognition of this procedure which is appearing more and more frequently in the medical literature. Recommendations and demands such as presented by Guttmacher and Barton and others can scarcely be condoned. What then is the answer?

It would seem logical that the first step lies in the creation of adequate legislation, which in

taking full cognizance of all the implications of heterologous artificial insemination would establish the legal machinery necessary to regulate the procedure in all its aspects. The impetus for such legislation might come from the legal bureau of the medical societies, perhaps most appropriately from the Bureau of Legal Medicine and Legislation of the American Medical Association, pending consideration of the problem by the assembly of delegates, or from the various state medical societies. The legal status of the procedure would thus be determined by law although still untested by the courts. Some clarification of the legal aspect of the problem is imperative to enable the physician to understand how he may best serve his patient and still remain within the law. Perhaps it would not be inappropriate to consider the following legislation which would primarily protect the child.

Any child conceived and born as the result of the impregnation of his mother by artificial insemination by a duly licensed physician or under his advice and direction, and upon the written consent of herself and her husband, shall have all the rights, privileges, and obligations of a child conceived and born as the result of impregnation through sexual intercourse of the husband and the wife, and no evidence concerning such artificial insemination shall be received in any action at law in equity or other legal proceeding which in any way may impair his rights, privileges, or obligations.

Artificial insemination is a modern procedure and it is time that society take a modern stand on the problem even though it finally may define it as illegal, to be considered in the same category as criminal abortion. At least any stand would constitute a bit of *terra firma* in a sea of uncertainty. However it is unlikely that the procedure will be considered illegal in later years.

Homologous. The legal issues incident to insemination with the husband's semen are practically negligible. It is conceivable that some liability might accrue relative to the source of the semen used. If the specimen is given to the physician by the husband in the wife's presence and the procedure is immediately carried out, all doubts should be dispelled.

THEOLOGICAL ASPECTS

When a physician is consulted by couples desirous of a pregnancy via the route of artificial insemination, he is faced with not only medical problems but theological problems as well. I believe it behooves us to consider and respect the views of different religious groups as they

ABSTRACTS OF CURRENT LITERATURE

SURGERY OF THE HEAD AND NECK

HEAD

Reld J. L., and McGuckin F.: *Cavernous Sinus Thrombophlebitis—A Report on 6 Consecutive Recoveries.* *J. Lar. Otol.* 1946, 61: 273

The authors present the cases of 6 patients who recovered from cavernous sinus thrombophlebitis, merely to illustrate the improvement in prognosis with the use of penicillin and sulfonamides.

In conclusion they state that without suggesting that cavernous sinus thrombophlebitis has ceased to be a grave lesion it is clear that the prognosis has been radically altered. Intensive modern therapy, preferably combining sulfonamides and penicillin, is justified even when the case by previous standards appears hopeless.

G. ALAN LIVA, M.D.

EYE

Klakadden W. S., and McGregor M. W.: *Coloboma of the Eyelids.* *Plast. Reconstr. Surg.* 1947 3: 60.

The authors report a case of the relatively rare condition of bilateral congenital coloboma of the upper eyelids. The surgical treatment of this condition is not always easy and if the results are inadequate or surgical correction is delayed, corneal scarring and impaired vision may result. This patient was one week old when first seen. In spite of frequent boric irrigations and adequate application of boric acid ointment, corneal ulceration gradually developed in both eyes during a period of 2½ months. At this time plastic reconstruction of the lids was done. The results were entirely satisfactory. The method of reconstruction was then compared with other methods of surgical correction of coloboma of the eyelids.

ROBERT H. JOHNSON, M.D.

Fox, S. A.: *Lid Repair and Reconstruction.* *Arch. Ophth.* 1947 30: 190.

The author describes the reconstruction of an obliterated eye socket with epidermis. He points out that Wheeler first presented this method in 1927. After the eyelids are dissected from the orbital canthi a tent is to the periosteum and behind the canthi a dental compound is fitted into the socket. Around this tent, an epidermic graft is wrapped with its epithelial surface directed inward.

Instead of dental stents, Fox recommends the use of acrylic forms which range in size from 42 by 32 mm. to 38 by 22 mm. and are from 3.5 to 4 mm. in thickness. The most frequently employed form is the 38 by 28 mm. size. After all the fibrous and granulation tissue has been excised epidermis approximately 3 by 4 in. in size and from 0.010 to 0.012 inch

in thickness is cut from the inner middle aspect of the arm. The dermatome cement enables the graft to adhere to the form. The eyelids are not sutured together but a patch is applied, over which a firm pressure dressing is placed. The eye dressing is removed after 7 days and a pressure bandage is reapplied for five more days. The form is removed, the socket irrigated and all excess epidermal tissue cleaned away. At the end of another week, a permanent prosthesis may be inserted.

Although the technique does not differ much from Wheeler's method, reconstruction is expedited and facilitated by the use of the acrylic forms. The graft obtained with the dermatome is uniformly thin and is a great improvement on grafts obtained with a knife. The latter contain sebaceous material and epithelial debris in which tears, mucus, and debris may collect and stagnate and in which low grade infections may occur.

JOSEPH ZUCKERMAN, M.D.

Kreusson W. E. III: *Surgical Methods of Treating Paralysis of the Superior Oblique Muscle.* *Arch. Ophth.* 1947 37: 121.

The author describes various methods used in the surgical treatment of paralysis of the superior oblique muscle. He stresses the disadvantages of weakening a depressor muscle and believes that weakening an elevator muscle is preferable since the need for binocular vision is more pronounced in the lower field. The final criteria depend on the measurements in the individual case. Adequate diagrams are given.

HUNTER H. ROMAN, M.D.

Gibson G. G.: *Marginal Myotomy: Analysis of 22 Cases.* *Arch. Ophth.* 1947 37: 175.

The use of marginal myotomy is advocated in the treatment of cases of concomitant strabismus of low degree in children in place of bilateral recession according to the method of Chavasse. The operation is performed on each internal rectus muscle posterior to the tendon which is said to produce a greater effect. Two incisions are placed in the margins of the muscle directly opposite to each other so as to cut all but the central 2 or 3 mm. of muscle.

Twenty two patients have been operated upon by this method with what the author considers fair success, although several had recurrences. Orthoptic treatment was not employed.

WILLIAM A. MANN, M.D.

Hughes, W. F. Jr.: *Treatment of Lewisite Burns of the Eye with Dimercaprol (Bal).* *Arch. Ophth.* 1947 37: 25.

The author discusses the factors concerned in the destructive lesions caused by lewisite burns of the

may apply in the case of any given patient. Our own views on the morality or immorality of artificial insemination are not by any means the only consideration. If we are to perform a real and honest service to patients and society it certainly is within the realm of duty to have an understanding of the stand taken on the problem by the various churches and to consider the spiritual well being of the family involved. Knowledge by both physician and patient of the theological views on the performance of artificial insemination is essential in the decision as to whether or not the procedure will contribute to the overall happiness of the family. Here then is another factor to be considered in the careful selection of cases.

It is interesting to examine the views held by the various religious groups. The problem has been most definitely defined by the Roman Catholic Church. In March 1897 the Holy Office issued a decree approved by Leo XIII condemning artificial fecundation as illicit. Apparently the decree referred to masturbation as methods of obtaining germ cells. There has been much discussion as to whether any form of artificial fecundation is permissible. In order to expedite this consideration homologous and heterologous artificial insemination will be considered separately.

The question of homologous insemination has been considered by Gerald Kelly, S. J. in a paper entitled *The Morality of Artificial Fecundation* which appeared in the *Ecclesiastical Review* (14) Six say that the procedure is illicit and 7 say that it is at least probably illicit. The conflict apparent arises in differences of opinion relative to the interpretation of the obligations contracted by the husband and wife in marriage. Those who say that it is illicit believe that sexual intercourse is the only obligation that each partner acquires and that the right to propagate is only an illicit feel that the right of propagation is a direct right of married people in much the same way that self preservation is the right of an individual. He has a natural right to preserve his life, and failing normal means, he may use abnormal or artificial forms of nourishment. So it seems that married people when unable to generate by the normal means of sexual intercourse, may use abnormal means provided that means be not sinful. An intrinsically unlawful means is never permissible even though it be directed toward achieving a good end. Included by Kelly among

permissible means of homologous artificial insemination are the 'forcing' of the spermatozoa from the vagina into the uterus by means of a syringe and the utilization of a hypothetical instrument to facilitate the passage of spermatozoa into the uterus.

From a practical standpoint these methods carry obvious inherent disadvantages. It has been suggested to me by an authority in scholastic philosophy a faculty member in a Catholic University that use of a perforated condom is probably permissible. The perforation, necessarily made so as not to interfere with the fundamental intent of the procreative act may be very small so as to enable the physician to utilize at least a portion of the specimen in making the transfer to the cervix.

In brief it may be stated that homologous artificial insemination is considered permissible in the Roman Catholic Church only if the means of accomplishing this end are not intrinsically sinful.

The employment of heterologous artificial insemination is on the other hand not permissible in any sense. Gerald Kelly in the above mentioned paper states that this procedure is against the laws of nature and that philosophically such a compact to care for the child would be termed accidental. He further states that married parties have no power to give such consent. The right of propagation taken directly or indirectly to the right of intercourse is in either case exclusive of a third party. Consent by the husband does not take away the injury to the marriage bond as established by God.

The artificial transplantation into the genital tract of a woman of spermatozoa from a man other than her husband constitutes a portion of the procreative act indeed the most important part, and as such must be interpreted in the eyes of God as adultery.

Another objection raised by the Roman Catholic Church is based on the fact that except for the highly impractical and unsuccessful method of testicular aspiration, all methods of obtaining spermatozoa are not permissible. There is then no way in which heterologous artificial insemination is reconciled to the moral philosophy of Roman Catholicism.

The views taken by the Episcopal Church are in essence the same as those expressed more definitely and legalistically by the Roman Church. There is no detailed consideration of the problem of homologous artificial insemination but the procedure is entirely acceptable. The use of donor semen however is condemned on the

grounds that such a means of insemination constitutes adultery.

The views held by the various protestant churches and the Reformed Jewish Church apparently have not been crystallized in print. For the most part it is safe to say that such views will attempt to concur with whatever state laws may be passed. Inasmuch as there is nothing in the Scripture forbidding it each protestant and reformed Jewish couple may follow their own wishes toward artificial insemination.

The Orthodox Jewish synagogue has taken no definitely expressed stand on the matter as yet. It is probable that homologous artificial insemination will be perfectly acceptable. However inasmuch as an orthodox Jewish marriage is only consummated at sexual intercourse, there is a distinct possibility that a child born to an orthodox Jewish couple as a result of heterologous artificial insemination may be considered as a bastard issue. The child would be conceived without sexual intercourse, a situation incompatible with consummate marriage. This concept is not the official expression of the synagogue but only the composite of personal expression among several rabbis.

Summarily homologous artificial insemination may be considered as compatible with the moral philosophy of all the common churches, if the Roman Catholic views on the means of achieving the result are respected. Heterologous artificial insemination, on the other hand, constitutes adultery in the light of Roman and Episcopal theology and it is possible that the Orthodox Jewish Synagogue may consider it conducive to the production of bastard issue although there has been no official expression on the subject as yet. Heterologous insemination is acceptable to the Reformed Jewish Church and the various Protestant Churches insofar as it concurs with existing state laws at least there is no definite expression against it.

SUMMARY

In accordance with the increased interest manifested in artificial insemination, an attempt has been made to present some of the practical aspects of the procedure in all its implications. Homologous and heterologous types are defined to differentiate between the use of semen from the husband and a donor respectively. The indications and techniques for each type are discussed. The results obtained by several investigators are reviewed and the author's small series is presented. The procedure is discussed from the standpoint of its legal and theological implications.

CONCLUSIONS

1. Heterologous artificial insemination may be considered when the wife is fertile and the husband sterile. It should be employed only after all efforts to improve the husband's fertility have failed. Constitutional or familial disease constitutes a doubtful indication.

2. Homologous artificial insemination is indicated in relatively few instances. It is not indicated as a last resort in cases in which no cause for infertility is found. It is indicated in conditions in which the spermatozoa are not transported to the cervix, as in impotence, dyspareunia, hypospadias, vaginismus, premature ejaculation, tumors, obesity and severe malpositions of the uterus. It is also indicated in those few cases in which the cervical secretions remain hostile in spite of persistent treatment and in which the Huchner test proves unsatisfactory.

3. The technique of insemination should be carried out cleanly and promptly and every attempt to reproduce the process of insemination as it occurs physiologically during normal intercourse should be made. In homologous insemination when hostile secretions represent the indication, the semen should be deposited within the cervix. In all other types of insemination the semen should be deposited upon the external os of the cervix. Insemination into the endometrial cavity is unsafe and not indicated.

4. If the given indications for homologous artificial insemination are observed the results are favorable. They are also good in the use of donor semen. However sustained effort may be necessary to achieve success just as a pregnancy is often accomplished in normal couples only after months of effort.

5. The legalities of heterologous insemination are a problem. The lack of legislation and judicial precedent relative to the procedure make for confusion and uncertainty. The time has come for legal recognition of the problem.

6. There are no real or practical theological objections to the use of husband semen, but the Roman Catholic, Episcopal, and perhaps the Orthodox Jewish Churches frown upon the use of donor semen.

7. Heterologous artificial insemination is a radical procedure. It should be considered after all efforts at treating infertility have failed. Prospective couples should be chosen with utmost care. The problem should be explained to them in full, including the legal and theological aspects. If when fortified with this knowledge, both husband and wife are enthusiastic to proceed, it

may be resorted to by the physician in the light of a real service rendered.

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INTERNATIONAL ABSTRACTS OF SURGERY

grounds that such a means of insemination constitutes adultery.

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construction of the disturbed anatomy of the eye has to be considered. The healing process and the fate of the perforated eye depends chiefly on the initial surgical treatment. The simplest and most successful method is to suture the sclera rather than only the conjunctiva.

The epithelium, the episclera, the suprachoroides, and the conjunctiva participate in the process of regeneration of wounds. The presence of regenerative tissue in the anterior chamber with resultant increase in the intraocular pressure in a wounded eye is of practical interest.

Proliferation of bands of tissue inside the eye which lead to atrophy of the eyeball are the products of "super regeneration" of the wound.

Proper closing of the wound is the first requisite for a good result. The edges of a wound should be correctly coated through the entire depth of the wound. Regulation and depression of the regenerative process by chemical and other methods is a second requisite.

The author points out that the extraordinary intensity of the regenerative process in the sclera and cornea may result in unfavorable conditions such as surplus growth with penetration by the regenerative tissue into the fluid media. The experience of histologists should be enlisted and their knowledge of regulation of the growth of the tissue elements should be applied.

It is also pointed out that although clinically similar autonomous fibromatosis in the eye has nothing in common with sympathetic ophthalmia.

JOSEPH ZUCKERMAN, M.D.

Newell, Frank W.: Traumatic Iridodialysis with Repair. *Am. J. Ophth.* 1947 30 695

Separation of the ciliary border of the iris from its attachment may occur spontaneously in atrophy of the iris root or may follow blunt ocular contusions. Small defects need not be treated but those large enough to cause symptoms should be corrected surgically provided there are not too many complications.

The author presents a case in which the eye had been struck by a small branch causing no damage except a separation of the entire nasal attachment of the iris from the ten to seven o'clock meridian. The pupil moved temporally. Because of the diminution of vision, dazzling and photophobia, surgery was done. A small conjunctival flap was prepared, a corneoscleral suture placed at two o'clock, and a small keratome incision was made between the loops of the suture. The peripheral border of the iris was grasped with an iris hook and drawn into the wound without prolapsing the iris. The suture was tied and the flap drawn over the wound. Five weeks later a similar operation was performed at the five o'clock meridian. The latter procedure formed a round pupil and left 3 small peripheral defects between the areas of attachment. There were no further symptoms and the patient had a corrected vision of 20/20 in that eye.

Reattachment of an iridodialysis will occasionally occur spontaneously but is so uncommon that it is usually corrected surgically either by an iridectomy by a reattachment to a fresh surface within the anterior chamber or in some cases by incarceration of the iris in a corneoscleral wound.

ROGER H. JOHNSON, M.D.

Chandler, Paul A., and Johnson, Carl C.: A Neglected Cause of Secondary Glaucoma in Eyes in Which the Lens is Absent or Subluxated. *Arch. Ophth.* Chic. 1947 37 740.

The authors describe a neglected cause of secondary glaucoma in eyes in which the lens is absent or subluxated. Glaucoma which develops in aphakic eyes spontaneously or following dislocation of a membrane may result from many factors which ultimately result in extensive peripheral anterior synechias. These factors include delayed reformation of the anterior chamber, prolapse of the iris, incarceration of the lens capsule or of the iris in the wound, adhesion of the hyaloid membrane to the wound and anterior synechia of an iris pillar. Other factors postulated are increased formation of aqueous resulting from traction during needling, and retained lens cortex or vitreous which blocks the angle and causes tension and glaucoma secondary to iritis or nevitis.

It is well known that when the lens is in situ occlusion of the pupil, with or without iris bombe may cause secondary glaucoma. Moreover this form of secondary glaucoma can be relieved if communication is re-established between the chambers by transfixion of the iris or by iridectomy, unless the angle has become permanently closed in long standing cases.

A similar cause for glaucoma is postulated in eyes in which the lens is absent or dislocated. The type of secondary glaucoma is discussed and illustrative cases are presented. Four types which are very similar are presented because the mechanism of the block is slightly different in each case.

In all 4 types shallowing of the anterior chamber may result in mechanical closure of the angle. Except for cases in which leakage occurs at the wound, there is no cause for progressive shallowing of the anterior chamber in an aphakic eye (or one in which the lens is partially or completely dislocated backward) other than lack of free communication between the posterior and the anterior chamber. Typical iris bombe, when present, immediately indicates a blocked pupil.

A dense pupillary membrane may be so firmly adherent to the iris peripheral to the pupillary border as to prevent a general shallowing of the anterior chamber. In doubtful cases of this kind transfixion of the iris can be used as a diagnostic procedure. If a pupil is completely blocked with a membrane (partly or wholly inflammatory), discission should be preceded by peripheral transfixion of the iris.

Glaucoma does not develop after intracapsular extraction unless the prolapsed vitreous completely

nystagmus occurs but is directed toward the operative side, accompanied by swimming or swaying or the less frequent whirling sensation of the body and objects. On looking straight ahead, slow oscillatory movements synchronous with the pulse, occasionally associated with nystagmus of the head and accentuated by pressure on the carotid artery of the ipsilateral side are seen instead of the jerky movements of genuine nystagmus. Spontaneous nystagmus usually disappears in 3 or 4 days and the dizziness is gone in a week except on sudden movements of the head, particularly toward the operated ear. By the fifteenth postoperative day all traces of the symptoms have disappeared.

In comparing labyrinthine findings subsequent to fenestration with those subsequent to surgical injuries of the semicircular canals, it was found that in the latter dizziness is immediate and more marked vomiting is outstanding, lasting for from 4 to 5 days and the spontaneous horizontal and rotatory nystagmus invariably runs toward the uninjured side and disappears in from 2 to 4 weeks. Surgical injuries are always followed by infection with impaired hearing and the nystagmus differs in duration and direction from that following fenestration, hence it is significant to note if the nystagmus is directed toward the side of the fenestration and decreases in a period of a few days, which is simply caused by the opening of the perilymphatic space. If the nystagmus is directed toward the other side and continues for more than a week, it is probable that an infection of the fenestra has occurred and the operation will not be successful. Slow oscillatory movements of the eyes and nystagmus of the head are not common symptoms of surgical injury of the horizontal semicircular canal but occur in the presence of pathologic fistulas secondary to infection of the tympanic cavity or in syphilitic infection of the internal ear. A hypothetical explanation of the oscillatory movements of the eyes is that they are due to the fact that hyperemic granulation tissue containing pulsating blood vessels continually pushes the endolymph to and from the ampulla; the vascular symptoms do not indicate an infection of the fenestra.

In the fistula test, made in 24 cases from 5 weeks to 14 months after operation, the cotton applicator yielded positive results more frequently than did compression and aspiration of the Politzer bag. The cotton applicator is inadequate and does not permit conclusions concerning the motility of the labyrinthine fluids and the status of the sensorial organs within the internal ear. This was shown by Uffenorde who showed that probing a fenestra may elicit nystagmus even in instances in which the turning and caloric tests no longer yielded positive results. If the fenestra responds to probing but not to air compression the results as far as hearing is concerned are poor and for this reason the fistula test should be performed with the Politzer bag and not with a cotton applicator. The location of the fistula on the horizontal semicircular canal does not exert any influence on the results of the fistula test. A positive

compression test does not necessarily indicate that the aspiration test will also produce the fistula symptom. The atypical results of the fistula test do not necessarily depend on inflammatory changes in the perilymphatic space. A. B. VICENCO, M.D.

Pulisaki Edwin J. and Matthews, Charles S.: Streptomycin in Surgical Infections: Otitis Externa, Otitis Media, Mastoiditis, Brain Abscess and Meningitis. *Arch. Otol.* Chic. 1947 45 593

The authors present the results obtained with the use of streptomycin in a group of 41 patients with otitis externa, otitis media, mastoiditis, brain abscess, and meningitis.

In 5 patients chronic otitis externa due to susceptible gram negative bacilli and gram positive cocci unaffected by other agents responded favorably to the topical administration of a solution of streptomycin. Of 13 patients with chronic otitis media of mixed bacterial cause, 11 were benefited by the topical application of streptomycin. A patient with mastoiditis and lateral sinus thrombosis recovered after surgical intervention and adjuvant administration of streptomycin. Recovery occurred in 7 patients and death in 1 patient with solitary brain abscess who were treated by surgery in combination with streptomycin therapy. Streptomycin, it is believed, is a valuable addition to the therapeutic armamentarium for infections of the ear, meninges, and brain when the infections are due to susceptible organisms.

NOAH D. FABRICANT, M.D.

Reading, Philip: Recurrent Mastoiditis. *Guy's Hosp. Rep., Lond.* 1946 95 79.

A consideration of the operative findings in the temporal bones of patients with recurrent mastoiditis prompted the writing of this article. Experience with this complication has led the author to the conviction that the cortical mastoidectomy of Schwartze be its clinical results good or bad, is based on unsound surgical principles. In his opinion, no matter what after treatment is adopted or how successful it may be, one cannot ignore the fact that the operation is based on unsound surgical principles. A cavity of varying size is left partially or completely clothed with epithelium. This cavity is continuous with the middle ear and Eustachian tube and so is open to reinfection at any time. Perhaps the day is not far distant when, with the advance of systemic penicillin therapy, the cortical mastoidectomy may be relegated to history. NOAH D. FABRICANT, M.D.

NOSE AND SINUSES

Burtuff Samuel: Evaluation of Diagnostic Methods Used in Cases of Maxillary Sinusitis, with a Comparative Study of Recent Therapeutic Agents Employed Locally. *Arch. Otol.*, Chic., 1947 45 516

The present article is based on a study of 100 cases, to evaluate the methods of diagnosing maxillary sinusitis. A comparison of the therapeutic value

of several solutions now in use for irrigating the sinuses was also made. A nonbactericidal and nonbacteriostatic agent, such as an isotonic solution of sodium chloride, used locally proved just as effective in bringing about resolution of the sinusitis as did the sulfathiazole and penicillin solutions, also used locally. Neither the sulfathiazole nor the penicillin in solutions proved to be of the value anticipated in the local treatment of maxillary sinusitis.

NOAH D. FABRICANT, M.D.

MOUTH

Alexander, John E.: Early Treatment of Maxillo-facial Battle Casualties; A Résumé of 421 Cases. *Arch. Otolaryngol.* 1947 45: 637

This is a résumé of the cases seen by a plastic maxillofacial surgery team of an auxiliary surgical group attached to one of the United States armies. It covers the period including the Battle of Normandy, the Battle of France, the Battle of the Ardennes, the Battle of the Rhineland and the Battle of Central Germany. The work was done in evacuation hospitals.

It is not a detailed account of all the work done nor is it a detailed description of individual cases. It is intended only to call attention to certain principles and to mention in summary fashion some of the more interesting and unusual aspects.

The statistical study covered a total of 421 operative cases. There were 3 deaths, which made the mortality rate 0.71 per cent.

Breaking the collection of cases down into an anatomic and descriptive classification presented a problem; hence it was decided to employ as nearly as possible a grouping related to the operative treatment which is shown in a table listed under 15 different headings. The cases include those subjected to split skin grafting, those requiring some type of plastic procedure such as sliding flaps, and those requiring repair of auricular defects.

No distinction was made between face wounds that were superficial and those that were deep so far as the decision to close them was concerned, provided certain conditions were met. These were drainage when indicated, absence of gross infection and adequate toilet of the wound.

The entire aim in this work has been to accomplish as much as possible at the first operation, with reconstructive procedures when this was practicable but the important principle of not doing any operation which if unsuccessful would preclude the final successful outcome of plastic surgical procedures to be done in the zone of the interior was kept in mind.

In a word it is felt that any one stage flap operation that is completed in that stage is capable of being accomplished in the first treatment of maxillofacial battle injuries. No stage of a plastic procedure involving another operative site should be started at this point in the treatment.

Sulfanilamide or penicillin were never applied to any wounds which were to be closed. However when

wounds were to be left open, penicillin powder was lightly sprayed on all raw surfaces.

Penicillin was used routinely in all cases in doses varying from 50,000 to 40,000 units, and was administered every 4 hours for 3 or 4 days.

This article is long and comprehensive and is illustrated with numerous figures and roentgen films. No definite summary can be made except to say that the field of maxillofacial surgery in war time has been thoroughly covered.

JOHN F. DUNN, M.D.

Young, Morris N.: Maxillofacial Fractures—187 Cases: Experiences with a Hospital in Cassablanca, Oran, and Marseille. *Arch. Otolaryngol.* 1947 45: 668.

This article is a historical treatise on the activities of the 66th Station Hospital during the African, Italian, and Southern France campaigns, and summarizes the histories of 187 cases of maxillofacial fractures. The routine treatment guide is submitted.

The general principles and procedures to be followed in the treatment of maxillary and mandibular fractures may be formulated as follows:

In early stages

1. Vigorous antishock therapy
2. Decision for tracheotomy not to be influenced by excessive conservatism.
3. Liberal use of penicillin and sulfonamide compounds.
4. Avoidance of barbiturates for general anesthesia.

In later stages

1. Adequate diet. Dietitians should be made "liquid jaw diet" and "soft jaw diet" conscious.
2. Careful application of suitable intracranial splinting devices, or if indicated, external pin fixation as modified for use in fractures of jaws.
3. Minimum period of immobilization of jaws.
4. Active and meticulous attention to oral hygiene.
5. When considerable avulsion of tissue has occurred early thin skin grafts may be used for protecting the surface pending reconstructive procedures.

In cases of osteomyelitis

1. Minimum sequestrectomy and curettage, through ample incision, after an initial period of preoperative re-establishment of normal metabolic levels.
2. Local and parenteral administration of penicillin.
3. Fixation of fracture by the most ample means.

JOHN F. DUNN, M.D.

Goodell, Ralph E. and Flanders, Sarah E.: Successful Primary Repair of Lacerated Stenson's Duct. *Surgery* 1947 31: 803.

The authors state that the anatomic location of Stenson's duct makes it subject to injury in deep wounds of the cheek. As failure to repair the duct results in a salivary fistula with many distressing symptoms, it is imperative to attempt to reapproximate the divided ends at the initial débridement.

Eight cases of primary suture of Stenson's duct have been recorded in the literature. The methods used varied but slightly. Success of the procedure seems to depend on the use of an inlying dowel firmly fixed in place at the time of early débridement. It is the purpose of the authors to give a brief review of the anatomy of Stenson's duct also to report another case of primary suture of the parotid duct and show the success of the procedure with accompanying pictures of the patient and sialograms taken 6 months following the operation.

The authors then give a brief discussion of the anatomy of Stenson's duct.

The case report was that of a 35 year old man who was admitted to the Bellevue Hospital on December 31, 1944 with multiple lacerations of the face and hands having been assaulted with a sharp instrument about an hour prior to admission. There was a deep laceration 6 cm. in length extending obliquely from over the zygoma at a point about 3 cm. anterior to the tragus of the left ear almost to the midpoint of the body of the mandible. The buccal mucosa was intact. He was unable to move the left side of the face. There was also a 2 cm. laceration over the lateral margin of the left eye and a 2 cm. laceration of the base of the nose. A 6 cm. laceration extended across the knuckles of the third to the fifth fingers of the left hand with division of the tendons and the laceration had penetrated directly into the bony substance partly severing the metacarpal heads. The patient had a flexion deformity of the third to the fifth fingers due to a pre-existing Dupuytren's contracture. A similar deformity involved the fifth finger of the right hand and there was a superficial laceration of the right thumb. The remainder of the examination was within normal limits except for an old upper right rectus scar.

Two hours after admission débridement and suture of the multiple lacerations were performed under sodium pentothal anesthesia. The lacerations of the tendons on the left hand were also repaired. All wounds were uncomplicated except for the one in front of the left ear where exploration revealed complete division of Stenson's duct in the masseteric portion and division of the three terminal branches of the facial nerve. After careful cleansing and irrigation of the wound and removal of all devitalized tissue, the masseter muscle was sutured and an attempt was made to approximate the severed ends of the facial nerve branches but the smallness of the branches made approximation doubtful. However the proximal end of the severed duct was easily identified and the distal end was located by passing a small urethral catheter through the orifice in the mouth. When the catheter emerged in the laceration, it was passed into the proximal segment of the duct. The two ends were then sutured over the catheter with interrupted sutures of fine black silk. Primary closure of the wound was carried out. The catheter was taped securely to the lower lip to hold it in place and a dry sterile dressing was applied.

Postoperatively the patient was given nothing by mouth and oral hygiene was maintained. He had a slight elevation of temperature for 4 days, spiking to 103° F on the fifth and sixth days with subsequent return to normal. On the fourth postoperative day there was slight swelling over the left parotid gland. The wound however was clean. There was a slight reaction about the orifice of the duct in the mouth. No flow of saliva was noted. The catheter was removed on the fifth postoperative day. The patient was fed parenterally until the sixth day when he was placed on a full fluid diet. He was given a soft diet on the seventh day and it was tolerated well with no swelling or pain in the region of the left parotid gland. A free flow of saliva was noted from the stoma of Stenson's duct. Because of the left facial paralysis, a tarsorraphy was performed on the twelfth day but the operation was unsuccessful. He was discharged from the hospital on the eighteenth postoperative day. The patient was contacted 6 months later at which time the sialograms were taken. There was no fistula, swelling or tenderness of the parotid gland and the sialogram showed a normal pattern with no stenosis of the duct.

The original article presents pictures of the patient 6 months postoperatively and reproductions of the sialograms.

The authors discuss the variants in the form of treatment of this and other cases reported in the literature. Constant factors were that débridement and suture were carried out as soon as possible after injury and an inlying dowel was used in every case but one. The type of dowel varied and it did not seem to make any difference which kind was used. Those that have been used have been still iodine catgut, silk worm gut, urethral catheters, fusiform bongs, and several others. Successful results were obtained in each instance which suggests that the type of dowel is not important. The use of the dowel is to maintain, but not to occlude completely the lumen of the duct until healing has occurred. In addition the anatomic structure of the duct probably contributes to success as its thickness allows accurate and substantial placement of the sutures. The type of suture used seems to make no difference. Catgut silk, and cotton have all been used with success. Some cases have been closed with drainage and others without.

It, therefore, appears from this report and other reports appearing in the literature that salivary fistula can be prevented by successful primary suture of Stenson's duct. WILLIAM A. ABROON, M.D.

NECK

Ward Robertson: Malignant Goiter. Lessons to be Learned from a 26 Year Follow Up. *West J Surg* 1947 55 383

This report is based upon the study of 170 cases of cancer of the thyroid gland. It is believed that the usual 5 year follow-up of cancer is not adequate

when dealing with malignant goiter. An 8 to 10 year remission of growth is not unusual after operation alone or with roentgen therapy. Nodular goiter and malignant goiter must be considered together for it is believed that nodular goiter is the breeding ground of malignancy. Malignancy in solitary adenomas was found in 13.6 per cent of 96 cases. Children under 15 cannot be excluded when malignancy in a nodular goiter is considered. A table showing the incidence in nodular goiter by sex is presented. In females, malignancy was present in 3.4 per cent and in males it was present in 13 per cent of nodular goiter.

The author suggests that a subtotal lobectomy should be performed for all solitary tumors in nodular goiters in males and children. When tumor thrombus is demonstrable in the lateral veins a sacrifice of the deep jugular vein is indicated. Metastatic deposits are removed by block dissection. One recurrent laryngeal nerve was sacrificed when it was imbedded in malignant tissue. X-ray therapy of bulky papillary tumors may cause sloughing. Radon seeds have been implanted in irremovable tissue. In the 3 groups listed the incidence of malignancy was shown to be between 13 and 24 per cent. Radioactive iodine was used in 10 cases. In 7 of these cases there was no measurable pickup of radioactive material by the malignant tissue. In 3 cases, there was a slight pickup and in 1 case, there was unusual deposition of radioactive material in the metastases. This leads one to believe that a tumor may be entirely eliminated or its growth may be arrested. It appears that adequate and early surgery is still our best prospect for the cure of malignant goiter.

RICHARD J. BENNETT, JR., M.D.

Hare, Hugh, F.: Cancer of the Thyroid. *Surg. Clin. N. America*, 1947 27 56

The classification of thyroid tumors according to Shields Warren is accepted as a basis for the present study. This is as follows:

Benign tumors (1) adenomas—embryonal fetal simple (Huerthle cell) colloid and (2) papillary cystadenomas—originating from thyroid or originating from aberrant thyroids.

Malignant tumors (Group I) tumors of low or potential malignancy—adenomas with papillary cystadenoma with blood vessel invasion originating in either the thyroid gland or in a aberrant thyroid tissue (Group II) moderately malignant adenocarcinomas—papillary, alveolar, Huerthle cell, and (Group III) tumors of high malignancy—small cell carcinomas (compact type, diffuse type) giant cell carcinomas, epidermoid carcinomas, fibrosarcomas, and lymphomas.

Between the years 1926 and 1936 240 patients with malignant tumors of the thyroid were treated. These were subsequently observed for 5 years or more. 120 of these were of Group I, 77 of Group II and 53 of Group III. Three were sarcomas.

Tumors of low or potential malignancy (Group I) usually developed from pre-existing single nontoxic

adenomas. The etiology of the more highly malignant tumors (Groups II and III) could not be determined.

Lateral aberrant thyroid tissue occasionally becomes malignant. Histologically such tumors are papillary cystadenomas and have none of the characteristics of thyroid tissue. Diagnosis rests on the known relationship of these tumors to aberrant thyroid tissue.

Tumors of Group I usually have a duration of from 1 to 5 years. Occasionally there is rapid growth during the last week or month. The preoperative diagnosis was often simple adenoma.

Tumors of Groups II and III are usually easily diagnosed. There is usually evidence of venous compression and a hard fixed infiltrating mass. There may be stridor. Thyroiditis may be confused with early malignancy. The distinguishing feature is that usually with thyroiditis the gland remains symmetrical, whereas with malignancy symmetry is lost.

An indication of malignant degeneration of an adenoma is the change from moderate firmness to induration. However a sudden and painful increase in hardness is more likely to be due to hemorrhage into an adenoma.

Other important signs of malignancy are attachment of the gland to prethyroid muscles and bone.

Toxic adenomas are rarely the site of malignant degeneration. Of 7 cases encountered in a 10 year period 4 occurred in patients with multiple colloid goiters and toxicity.

Surgical removal is indicated for all malignancies of the thyroid. Although the low or potentially malignant group can be completely removed surgically radiation treatment following surgery is advised because of frequent recurrences and because these tumors are radiosensitive.

With the more malignant tumors, it is essential that adequate radiation should be delivered to the entire field by crossfire technique with one portal on each side of the neck and one in the midline. A dose of 2,000 roentgens measured in air is given to each portal making a total of 6,000 roentgens for one series of treatment. The daily treatment is 150 roentgens for each portal, except for debilitated patients who receive 100 roentgens. The following factors were used: 200 k.v.p. 20 ma., 24 roentgens per min., 1 mm. of copper 1 mm. of aluminum, 50 cm. distance portal from 7 to 10 sq. cm., and half layer value 13.

CURTIS H. THURMAN, M.D.

Labey, Frank H.: Tumors of the Neck. *Surg. Clin. N. America*, 1947 7 456.

Tumors of the neck are discussed under three headings: midline tumors, solitary lateral tumors, and multiple tumors of the neck. All midline tumors of the neck are of thyroid origin. Rarely there is complete failure of the thyroid to descend and a lingual thyroid results. These thyroid glands require removal only because of pressure symptoms after their surgical removal the patient will be completely

eye. A single instillation of dimercaprol solution or ointment within from 2 to 5 minutes after exposure to lewisite effectively prevents the development of serious ocular lesions. The method by which the drug works is described.

HUNTER H. ROMAN, M.D.

Godfredsen, E.: Ophthalmoneurological Symptoms in Connection with Malignant Nasopharyngeal Tumors. *Brit J Ophth.*, 1947 1 78.

The author indicates that the ophthalmoneurological symptoms in connection with malignant nasopharyngeal tumors occur both earlier and to a greater extent than is generally known, and that the ophthalmological symptoms predominate chiefly as ophthalmoplegia with or without attending trigeminal neuralgia. Patients suffering from this condition frequently will go first to the ophthalmologist which puts the diagnosis up to him.

HUNTER H. ROMAN, M.D.

Gordon, D. M.: Ocular Sporotrichosis: Report of a Case. *Arch. Ophth., Chic.*, 1947 37 56.

The author reviews the literature on ocular sporotrichosis and reports a case in his own experience. He points out that 48 cases have been reported in the literature. Thirty-four were primary and 15 were secondary to involvement elsewhere in the body.

The following parts were affected: the eyelids in 17 cases; the conjunctiva in 10; the lacrimal sac in 1; the conjunctiva and lacrimal apparatus in 1 case; the eyebrows in 1; the intraocular tissues in 5 cases; the orbit and eyelids in 5; the cornea in 3; the limbus in 1 case; the uveal tract in 1; and the lacrimal canal in 1. Ten of the cases occurred in the United States; most of the others occurred in France.

The disease responds to potassium iodide. A saturated solution is administered, beginning with 10 drops 3 to 4 times a day which is increased by 5 drops per dose per day until the limit of tolerance has been reached. Treatment is continued for several weeks. Iodides stimulate the fibroblastic elements to proliferate and to encapsulate the sporotrichum.

JOSUUA ZUCKERMAN, M.D.

Samuels, B.: Proliferation of Lens Epithelium. *Am. J. Ophth.*, 1947 3 1.

The author believes that a strict differentiation between ectoderm and mesoderm cannot always be made. It is possible for the epithelial cells of the lens, when irritated to lay down a tissue, the anterior subcapsular cataract, that has physical qualities more of mesoderm than ectoderm. Following extracapsular cataract extraction, there may be a proliferation of germinal cells in Soemmering's crystalline swelling or of the subcapsular epithelium to form the pearls of Elchnig.

The purpose of this article is to summarize the proliferation of the epithelial cells of the lens in 185 cases of nontraumatic cataracts. This did not include cases which may have had a rupture of the capsule since the author did not wish to have any in which other

cells entered the discussion. He does not believe that cells pass through the lens capsule. He found that the greatest proliferation occurred in the cases with corneal scars and detachment of the retina and in cases of spontaneous iritis. The lenses that showed the least proliferation were found in the cases of intraocular tumors and glaucoma. He found that the proliferation of anterior capsular epithelium (subcapsular cataract) was most commonly central and that this was due to the absence of the protective influence of the iris. Subcapsular cataracts may also be excentric, equatorial, and posterior.

He found three types of anterior polar cataracts: the widespread type with an undulating anterior surface, the pyramidal type, and the thin fibrous type with sharp wrinkles in the capsule. He believes that they are made up of an epithelial connective tissue. The pyramidal cataract was most frequently associated with corneal ulcers and was thought to be due to a short concentrated exposure to toxins. More extensive proliferation was characteristic of the cases of spontaneous retinal detachment. When the germinal cells have disappeared or have fallen away from the capsule, the anterior cells may take their place and grow backward to form one continuous layer of cells. Occasionally the lens epithelium will attempt to repair an area of necrotic cells but being unable to do so forms a homogeneous mass about this area. The proliferation of germinal cells usually occurred in liquefied lenses and was characterized by large bladderlike cells at the equator or along the posterior capsule. They frequently merged into large cystic spaces. Whenever a subcapsular cataract was found at the equator or posteriorly it was considered to be a product of wandering anterior subcapsular cells.

Occasionally the capsular cells elongated, in 3 cases drossen were found under the capsule and in 3 cases there were no epithelial cells. In 1 case the whole germinal zone was detached and floated about in the liquefied cortex.

ROBERT H. JOHNSON, M.D.

Martin-Jones, J. D.: Uveal Sarcomas. *Brit. J. Ophth.*, 1946, 30, 3, Supp.

The author has written a monograph on the relatively rare condition of intraocular sarcoma. He believes that trauma and heredity do not play a part in the etiology but that areas of pigmentation, pigmentary disturbances, areas of choroiditis, and hemorrhages in the macular region are factors. These tumors seem to be equally distributed between the two sexes. In this series the average age of incidence was 51.9 years, the youngest patient being 13½ years and the oldest 87 years. The author found that 38.5 per cent of the patients did not come for examination until their vision was nil although 2.5 per cent still had useful vision.

He uses the customary procedure of dividing the course of an intraocular sarcoma into four stages: the quiescent stage, the stage of glaucoma, the period of perforation into the orbit, and the stage of generalized metastasis. The last stage may occur at any time.

myxedematous. These tumors can often be successfully removed through the mouth. Thyroglossal cysts and sinuses are another form of midline tumor. Not only must the cyst be completely excised but the central portion of the hyoid cone and a portion of the base of the tongue must be completely removed to avoid recurrences. Some adenomas of the thyroid are midline tumors. The author is of the opinion that all discrete adenomas of the thyroid should be removed because of the danger of malignant degeneration.

The treatment of single discrete laterally located tumors of the neck is important because of the fact that not a few of them are or become malignant. The most common tumors in this location are the branchial cysts. They empty into the pharynx close to the tonsil. Below the level of the digastric muscle these cysts and sinuses are superficial in position. The best method of treating branchial cysts and sinuses is by their surgical removal through multiple small incisions. The next most common laterally located tumors of the neck are lateral aberrant thyroid tissue. They may be single discrete tumors or they may be multiple. When discrete a diagnosis is only possible upon microscopic examination. They also are superficial in position. In the 47 patients seen with lateral aberrant thyroids 9 were malignant and 2 patients have died. The tumors are highly radio-sensitive and radical removal followed by high volt-

age x ray therapy gives good results. One of the rare tumors of the neck is a tumor of the carotid body. These tumors cannot be moved downward because of the fact that their descent is limited by their origin in the carotid notch. Also they tend to grow inward and are deeply located as contrasted to the previously mentioned tumors. When these tumors surround the three vessels so that ligation of all these structures would be required for the removal of the tissue, the author believes that the danger of malignancy is less than the danger of the ligations. In such a situation he does not remove the tumor. Figures as to the percentage of malignancy in these tumors vary from 50 to 80 per cent. Neurofibromas may also be found as lateral single neck tumors.

When multiple tumors and cysts of the neck are present, diagnosis is more difficult. Tuberculous cervical adenitis is still occasionally seen and is best treated by irradiation. Hodgkins disease of the glands of the neck must always be considered in the presence of multiple neck tumors. Multiple neck tumors may result from malignant metastases, adenomas of the thyroid and lateral aberrant thyroid tissue. The one outstanding feature which distinguishes intrathoracic goiter from most other mediastinal tumors is the fact that it ascends and descends with swallowing. The only other tumors which do this are certain benign esophageal tumors.

F. J. LEEBMAN, JR., M.D.

INTERNATIONAL ABSTRACTS OF SURGERY

when dealing with malignant goiter. An 8 to 10 year remission of growth is not unusual after operation alone or with roentgen therapy. Nodular goiter and malignant goiter must be considered together for it is believed that nodular goiter is the breeding ground of malignancy. Malignancy in solitary adenomas was found in 15.6 per cent of 96 cases. Children under 15 cannot be excluded when malignancy in a nodular goiter is considered. A table showing the incidence in nodular goiter by sex is presented. In females malignancy was present in 3.4 per cent, and in males it was present in 12 per cent of nodular goiter.

The author suggests that a subtotal lobectomy should be performed for all solitary tumors in nodular goiters in males and children. When tumor thrombus is demonstrable in the lateral veins a sacrifice of the deep jugular vein is indicated. Metastatic deposits are removed by block dissection. One or more current laryngeal nerve was sacrificed when it was imbedded in malignant tissue. X-ray therapy of bulky papillary tumors may cause sloughing. Radon seeds have been implanted in unresectable tissue. In the 3 groups listed the incidence of malignancy was shown to be between 12 and 24 per cent. Radioactive iodine was used in 10 cases. In 7 of these cases there was no measurable pickup of radioactive material by the malignant tissue. In 3 cases, there was a slight pickup and in 2 cases, there was unusual deposition of radioactive material in the metastases. This leads one to believe that a tumor may be entirely eliminated or its growth may be arrested. It appears that adequate and early surgery is still our best prospect for the cure of malignant goiter.

Richard J. Brody, Jr. M.D.
Hara, Hugh, F.: Cancer of the Thyroid. *Surg. Clin. N. America*, 1947, 7, 56.

The classification of thyroid tumors according to Shields Warren is accepted as a basis for the present study. This is as follows:

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Between the years 1926 and 1936 240 patients with malignant tumors of the thyroid were treated. More than 110 of these were observed for 5 years or more and 53 of Group III. Three were sarcomas. Tumors of low or potential malignancy (Group I) usually developed from pre-existing single nontoxic

adenomas. The etiology of the more highly malignant tumors (Groups II and III) could not be determined.

Lateral aberrant thyroid tissue occasionally becomes malignant. Histologically such tumors are papillary cystadenomas and have none of the characteristics of thyroid tissue. Diagnosis rests on the known relationship of these tumors to aberrant thyroid tissue.

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Surgical removal is indicated for all malignancies of the thyroid. Although the low or potentially malignant group can be completely removed surgically radiation treatment following surgery is advised because of frequent recurrences and because these tumors are radiosensitive.

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Clinton H. Timms, M.D.

Lahey, Frank H.: Tumors of the Neck. *Surg. Clin. N. America*, 1947, 7, 465.

Tumors of the neck are discussed under three headings: midline tumors, solitary lateral tumors, and multiple tumors of the neck. All midline tumors of the neck are of thyroid origin. Rarely there is complete failure of the thyroid to descend and a lingual thyroid results. These thyroid glands require removal only because of pressure symptoms after their surgical removal the patient will be completely

myxedematous. These tumors can often be successfully removed through the mouth. Thyroglossal cysts and sinuses are another form of midline tumor. Not only must the cyst be completely excised but the central portion of the hyoid bone and a portion of the base of the tongue must be completely removed to avoid recurrences. Some adenomas of the thyroid are midline tumors. The author is of the opinion that all discrete adenomas of the thyroid should be removed because of the danger of malignant degeneration.

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age x-ray therapy gives good results. One of the rare tumors of the neck is a tumor of the carotid body. These tumors cannot be moved downward because of the fact that their descent is limited by their origin in the carotid notch. Also they tend to grow inward and are deeply located as contrasted to the previously mentioned tumors. When these tumors surround the three vessels so that ligation of all these structures would be required for the removal of the tissue, the author believes that the danger of malignancy is less than the danger of the ligations. In such a situation he does not remove the tumor. Figures as to the percentage of malignancy in these tumors vary from 50 to 20 per cent. Neurofibromas may also be found as lateral single neck tumors.

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F J LESTERMAN, JR., M.D.

SURGERY OF THE NERVOUS SYSTEM

BRAIN AND ITS COVERINGS; CRANIAL NERVES

War Surgery Supp. No. 1. Wounds of the Head.
Brit. J. Surg. 947 Supp. 1

In 1944 the British Journal of Surgery devoted one issue to the subject of penicillin, at a time when considerably less was known about the total possibilities and limitations of the drug than is true today. However that volume still stands as a sound treatise on the subject. The same journal has now devoted an issue to the subject of wounds of the head, dealing with the British military experience in neurosurgery during the period from 1939 to 1945. Again, it is likely that the subject of military neurosurgery will not soon again be covered in such a comprehensive and instructive manner.

The experiences reviewed in the present volume cover all the various theaters of the war and all the major campaigns and battles. The bulk of the collected papers are from the Army though the Royal Navy is also represented with its smaller number of casualties.

A fitting introduction has been written by Geoffrey Jefferson, whose broad experience as one of England's senior neurosurgeons bridges the two great world wars. The highlight of this memorable collection however is the second article that by Hugh Cairns, which deals with the organization and early development of the neurosurgical organization of the British military: the evolution of the treatment of the uncomplicated vertex wound of the brain, special types of brain wounds, infections, the specific neurological signs of head wounds, after care, the special factors of success and failure in treatment, and a consideration of other outstanding problems. From this paper alone the reader may appreciate the value of highly trained mobile, closely co-ordinated teams of surgical specialists working near the front after the manner of the British Mobile Neurosurgical Units. From this the American Army Medical Corps could learn and profit much. The British were realists. The time came when they found themselves increasingly poor in man power and the saving of life, time, transport and other effort, with the early return of the patient to duty was with them a much more vital concern than apparently was true in our own organization.

The volume is profusely and well illustrated. The colored illustrations of Shorstein's article are remarkably good and tell the story even without the text. The rather stylized format of all the articles makes reading pleasant and easy to remember. The subjects of infection, complications, and chemotherapy are considered from every angle and in most instances case reports, where used effectively drive home good points. Ascroft's interesting article on his survey of 662 fatal head wounds is included.

Also included are several papers which were presented in their original form at the neurosurgical meetings in Rome and Florence in February and March of 1945 and many American neurosurgeons who were present at those meetings will recall with interest those days in association with a most stimulating group of British doctors.

This remarkable volume is recommended to all military administrators, members of the American Army and Navy Medical Corps, and neurosurgeons in general. It should be compulsory reading for all medical students before graduation.

JOHN MARTIN, M.D.

Govan, Clifton D., Jr., and Walsh, Frank B.: Symptomatology of Subdural Hematoma in Infants and in Adults: Comparative Study with Particular Reference to the Ocular Signs; An Observation Concerning the Pathogenesis of Subdural Hematoma. *Arch. Ophth., Chic.*, 947 37 702

The symptomatology of subdural hematoma in infants and in adults has been discussed in considerable detail by the authors. A reported series of 30 infants and 1 older child of 8 years was compared with an adult group of 54 patients. The point was stressed that there was only 1 patient in the age group of "two to twenty years."

Of the infants, 21 were males and 15 were females. Nineteen of the 37 infants and 49 of the 54 adults had a history of trauma.

The nutritional state in 24 of the infants was poor. No accurate evaluation was made in the adults.

Convulsions were present in 18 of 35 infants, in contrast to the adults, only 2 of whom had convulsions.

Vomiting was present in 18 of the infants and in 16 of the adults.

Twenty infants were drowsy with retained irritability to stimulation. Only 2 of the infants were reported as alert. Drowsiness was a very frequent finding in the adults.

Bulging of the fontanelle was present in 26 of 28 infants with an open fontanelle. One third of the infants had an elevated temperature. In the adults no accurate figures on this point were available.

The hematoma was unilateral in 51 of 54 adults; hemiparesis was present in 22 in 17 weakness was contralateral, and in 4 ipsilateral.

The spinal fluid in the infants invariably contained blood or was xanthochromic. In the great majority of adults, the spinal fluid was normal.

Papilledema was estimated as 50 per cent in adults, although in this series only about 17 per cent of both adults and infants were reported as showing papilledema. The type of papilledema in adults is similar to that observed in cases of tumor; there may or may not be retinal hemorrhages of nerve fiber layer type.

In infants almost invariably subhyaloid retinal hemorrhages are visible.

In adults unilateral dilatation of the pupil is frequently found on the side of the hematoma. In frequently the pupil contralateral to the lesion was dilated. Dilatation of the pupil has been attributed by Reid and Cone and Woodhall, and their associates, to herniation of the hippocampus of the medial aspect of the temporal lobe and midbrain through the tentorium. As a result of such herniations pressure was produced on the homolateral third nerve with development of an internal ophthalmoplegia which may be associated with ptosis.

Sixth nerve palsy was present unilaterally in 3 adults and bilaterally in 1 adult. Nystagmus was present in only 3 adults. Conjugate deviation of the eyes away from the side of the lesion was present in 2 adults. Visual field changes were infrequent.

The authors have made the observation that in infants the hemorrhage is almost always bilateral and the spinal fluid bloody. In contrast to the situation in adults in whom it was a very infrequent finding. It is noted also that frequently in infants there is no history of trauma whereas in adults there is almost invariably a history of trauma.

Anatomical studies show that in the infant the dura and delicate arachnoid membrane are easily separated from the vessels and pia mater close to the midline. These veins in emptying into the longitudinal sinus, are relatively unsupported for distances varying from a few millimetres to one centimeter which the authors feel is an important point in the frequency of bilateral bleeding in infants as well as the frequent findings of blood in the spinal fluid.

In contrast to this condition it is pointed out that in adults the dura and the arachnoid membrane are firmly bound together in the region of the longitudinal sinus. This attachment of the arachnoid to the dura is formed by masses of fibrous tissue forming the base of arachnoid villi (pacchionian granulations).

HOWARD A. BROWN, M.D.

Bingham John A. W.: Causalgia of the Face
Brit. M. J. 1947 1: 504.

The author describes 2 cases of causalgia of the face. The condition was successfully treated by dividing the sympathetic chain below the superior sympathetic ganglion and by resecting the lower half of the ganglion.

The first case was that of a 28 year old Indian who had received a small penetrating wound of the right cheek. X ray examination revealed a small metallic fragment under the base of the skull in the region of the foramen ovale. Burning pain developed immediately in the right side of the face and was still present when he was seen a year later. The pain was described as continuous and involved all three divisions of the trigeminal nerve. There was also marked hyperalgesia of the skin in the same area and the pain was aggravated by warmth, with eating, or with much talking. A procaine-alcohol injection of the stellate ganglion gave immediate

temporary relief of the pain but 3 weeks following injection the facial pain and tenderness recurred. Under local anesthesia the right superior sympathetic ganglion was exposed. The chain was divided and the lower half of the ganglion was excised. The facial pain and tenderness were again completely relieved and there was no sign of recurrence 3 months later.

The second patient also received small penetrating wounds of the left side of the face and head. Three months following injury he noted continuous burning pain confined to the maxillary division of the trigeminal nerve. X rays showed multiple foreign bodies in the scalp and left parietal area and left temporal fossa. As in the first case a marked hyperalgesia of the skin of the cheek was present. A procaine-alcohol injection gave immediate but temporary relief of pain and later the lower half of the superior sympathetic ganglion and a portion of the sympathetic chain were excised. Facial pain and tenderness were relieved immediately.

A brief discussion of the etiology and mechanism of production of causalgia pain is presented. The author believes that sympathectomy relieves causalgic pain by interrupting the sensory pathway.

HOWARD H. LANDER, M.D.

PERIPHERAL NERVES

Davis, Loyal Martin John; and Perret, George
The Treatment of Injuries of the Brachial Plexus. *Ann Surg* 1947 135: 647

The authors state that injuries to the various parts of the brachial plexus may be of the same general nature regardless of whether the patient is of civilian or military status. Blunt injuries, such as direct blows or traction and attenuation of the plexus, occurred in 17 of their 47 patients, whereas the other 30 patients suffered open injury of the plexus, either through gunshot or stab wounds.

In the blunt closed injuries the funiculi are torn apart not cut at any one particular level as in the open injuries, and such ruptures may occur at any point from the origin of the roots at the spinal cord to the most distal part of the nerve trunks. The resulting lesions are those of complete or incomplete anatomic or physiologic lesions which should not be classified as "upper" or "lower" types. The record of the examination must show that the lesion has been located by a careful examination of the affected muscles and the sensory patterns. By no other method can accurate diagnosis or final evaluation of the residual lesions be made.

Admittedly injuries of the brachial plexus are difficult of evaluation as to the probable extent of spontaneous recovery and especially is this true in the blunt injury. Such recovery may progress over months and years. Obviously the results of surgical treatment of such lesions could never be as good as they are in simpler peripheral nerve injuries. Rarely is end to end suture possible, and for that reason the use of nerve grafts should be

of distinct value when gaps occur after the open type of injury. Neither type of injury should be denied the benefit of surgical treatment when, with persistent physical therapy the progress of recovery has reached a stand still. Neurolysis with careful removal of all constricting bands and scar tissue should be followed by a regimen of physical therapy planned for many months. Estimations of the recovery of function in all peripheral nerve surgery must be based upon the recovery of sensation in isolated areas of supply and upon the recovery of movement in muscles whose action cannot be limited by supplementary movements.

JOHN MARTIN, M.D.

Amnersten, Svante: Studies on the Scalenus Anticus Syndrome. *Acta chir. scand.*, 1947 95 439.

The author reviews the mechanism of the scalenus anticus syndrome as previously given in numerous articles published in this country and describes a method of measurement of the transverse process of the seventh cervical vertebra. He has studied these measurements in 400 roentgenograms of the neck, and has compared them with the length of the transverse process of the first thoracic vertebra thus establishing an index which he believes will be of help in determining those conditions that may fall into the category of the scalenus anticus syndrome and be benefited by surgical measures.

In conclusion the author states that scalenotomy alone is sufficient in those cases in which compression of the nerve is brought about by pressure of the scalenus muscle upon the costotransverse process of the seventh cervical vertebra. If the transverse process is enlarged—even without a true rib—such compression is likely to occur and this enlargement was present in the majority of the cases reported in the present article.

Such compression also may give rise to vasomotor disturbances in addition to those of purely neurogenic character.

HOWARD A. BROWN, M.D.

Björkstén G af Suture of War Injuries to Peripheral Nerves. Clinical Studies of Results. *Acta chir. scand.*, 1947 95 Supp. 19.

The author has studied a series of 756 Finnish war casualties in whom nerve sutures were performed for a postoperative period extending from 6 months to 5 years. In judging the amount of recovery he considered only return in motor function. Of 756 nerve sutures, only 13 were primary sutures performed immediately after the injury in a field hospital, the other 744 were secondary sutures performed in a general hospital. The primary sutures became infected in 50 per cent of the cases and their recovery was not satisfactory. The positive results in secondary sutures depended only to a small extent on the interval between trauma and operation. Among the patients operated upon during the first 3 months after the injury the results were positive in 89.8 per cent, and this number gradually decreased to 71.7 per cent for patients operated upon later than

Nerve	Number of cases	Percentage of qualitative results			Post-operative results per case	Average results per cent
		Good	Medium	Poor		
Brachial Plexus	8	12.5	25.0	62.5	308	
Musculocutaneous	30	30	30	30	100	
Radial	125	8	41.5	50.5	95.8	
Median	65	9	44.8	46.2	83.8	6
Ulnar	81	9.9	43	47.1	90.6	9.4
Femoral	30	30	30	30	100	
Sciatic (tibial portion)	84	23.8	52.4	23.8	79.8	20
Sciatic (peroneal portion)	84	3	75.0	22.0	37	43
Tibial	6	1	66.6	33.3	64.7	3.3
Peroneal	18	11.1	44.4	44.4	72.2	27.8
	73	16.7	30.3	53.0	84.8	15.2

a year after trauma. However qualitatively much better results were obtained when the nerve was sutured early and the failures outnumbered the satisfactory results when the nerve suture was performed later than 9 months after injury.

Signs of motor recovery were observed earlier in the upper than in the lower extremity but the tibial and the radial nerves were observed to require the shortest period of regeneration. The author also found that motor recovery was much delayed in low or distal lesions as compared to more proximally situated lesions. In no instance did he observe any return of function in the small muscles of the foot, and reinnervation of the small hand muscles was usually slow and incomplete. He never saw complete restitution of function in any of them even 5 years after operation. The above table shows the results obtained 1 year after suture.

The age of the patients played only a minor role. The author states, however, that the 50 oldest patients (between 47 and 51 years of age) showed much poorer results than the 50 youngest patients who were between 17 and 31 years of age. Nerve lesions accompanied by fractures showed poorer results, which the author attributed to delay in suturing the nerve, necessitated by the time required for healing of the fracture and also by complicating lesions of the soft tissues, so that it was often impossible to isolate the nerve from the bony callus. Lesions to the main arterial trunk of the affected extremity did not seem to alter the rate and degree of motor recovery. The influence of postoperative wound infections on motor recovery was not as great in secondary suture as in primary suture. Sulfathiazole was used locally in a small number of cases which could not be evaluated.

No difference in the quality of motor recovery could be observed following sutures performed with and without tension, and no harm was noticed following moderate stretching of the nerve segments.

The two-stage operation yielded good results in several cases in which it was impossible to approximate the nerve ends at the first operation. Recovery did not seem to be influenced by a rotation of the two severed nerve segments but was definitely poorer when a large loss of nerve substance was present. The author warned against a resection of the two nerve stumps beyond what was absolutely necessary. He also suggested an oblique resection of the two nerve ends when there was a difference in the diameter of the central and the distal stump in order to facilitate approximation and suture. He found that an immobilization period of 4 weeks was usually sufficient and that it had little to do with a secondary rupture of the suture line.

Although no specific effects of the postoperative treatment on recovery were noticed all patients received postural treatment, heat, galvanic and faradic stimulation, passive and active movements, and gymnastics, and especially rehabilitating activity. The qualitative results seemed to depend on the degree of motility preserved in the joints of the affected limb and on the absence of contractures. The main objective of the postoperative treatment was to preserve the full range of passive motility of the paralyzed extremity. It was clinically impossible to prove that the electrical treatments had any influence on recovery but they were considered justifiable because of their psychological effect.

GEORGE FRANK M.D.

MISCELLANEOUS

Paine, Tom F.; Murray, Roderick; Harris, H. W. H.; Finland, Maxwell; and Wilcox, Clares: Streptomycin in the Treatment of Certain Gram Negative Bacillus Infections of the Central Nervous System. *Am. J. Med. Sc.*, 1947 213 676

The report presented deals with 5 cases of gram negative bacillus infections of the meninges in which recovery followed treatment with streptomycin. The causative organisms were *Pseudomonas aeruginosa* (*Bacillus pyocyaneus*) and *Hemophilus influenzae*, each in 2 cases, and *Bacillus proteus* in 1 case. In the past these organisms have been highly resistant to the action of both the sulfa compounds and penicillin.

The case reports are accompanied by charts showing the important findings in each particular case. The total daily intramuscular dose ranged from 0.2 gm. to 4 gm. The intrathecal dose consisted of 0.05 gm. in 1 ml. of sterile normal saline.

The authors evaluate the role of streptomycin in the cases of *Pseudomonas aeruginosa* meningitis. In case 1 the clinical and bacteriologic response of the patient following the institution of therapy was prompt. In this patient, the infection followed lumbar puncture and streptomycin was started relatively early in the course of the disease but only after several days of apparently ineffective penicillin and sulfadiazine therapy. In case 2 strepto-

mycin therapy was not begun until the seventh day of the disease, after 4 days of ineffective penicillin therapy. The response of the infant to streptomycin was only gradual and there was evidence of residual damage to the central nervous system after treatment. In the period of 7 days before streptomycin was begun there was more than a simple time damage on the central nervous system.

In case 3 with *Bacillus proteus morganii* meningitis organisms disappeared from the cerebrospinal fluid only after the institution of streptomycin therapy, though some clinical improvement had occurred during the preceding period while penicillin and sulfadiazine were being given. Here again the recovery may be ascribed to streptomycin.

In case 4, with *Hemophilus influenzae* meningitis streptomycin therapy was attended by a prompt clinical and bacteriologic response. Since no other medications were used in this patient, streptomycin would seem responsible for the cure obtained in this infant. An elevation of temperature and a pleocytosis of the cerebrospinal fluid was noted in 3 of the patients following the intrathecal injection of streptomycin.

The transient untoward effects of the local use of streptomycin would indicate that the intraventricular and intrathecal routes for the administration of streptomycin should be used with caution. Streptomycin administered by the intrathecal and intramuscular routes would seem to be the drug of choice in the treatment of meningitis due to these gram negative bacilli. HOWARD H. LANDER, M.D.

Craig, Winchell McK. and Abbott, Kenneth H.: Surgical Considerations in the Treatment of Hypertension. *Ann. Surg.* 1947 125 608.

The surgical treatment for the relief of hypertension has passed through the stage of radical rhizotomy into that of extraspinal resection of the splanchnic nerves and the thoracic and lumbar sympathetic ganglia and trunks.

Classification and grouping of the disease have been chosen arbitrarily for a comparison between the medical treatment, on the one hand and various types of surgical procedures, on the other. No satisfactory single criterion for the prediction of successful operations has been developed. It has been agreed that even the most extensive of the operations cannot change the clinical status of hypertension which has advanced to the degree of irreversible changes in the vessels of the heart, kidneys, brain, and other organs.

The nature of the operation is physiologic rather than pathologic and the results depend on the physiologic response of the vascular system. All types of sympathectomy and splanchnicectomy have been followed by arrest of the progress of the disease and alleviation of symptoms. Although it is true that the more extensive operations have resulted in greater denervation of the vascular system they also result in a more extensive cutaneous area of non-

of distinct value when gaps occur after the open type of injury. Neither type of injury should be denied the benefit of surgical treatment when with persistent physical therapy the progress of recovery has reached a stand still. Neurolysis with careful removal of all constricting bands and scar tissue should be followed by a regimen of physical therapy planned for many months. Estimations of the recovery of function in all peripheral nerve surgery must be based upon the recovery of sensation in isolated areas of supply and upon the recovery of movement in muscles whose action cannot be imitated by supplementary movements.

JOHN MARTIN M.D.

Arnersten, Granite. Studies on the Scalenus Anticus Syndrome. *Acta chir scand.* 1947 95 419

The author reviews the mechanism of the scalenus anticus syndrome as previously given in numerous articles published in this country and describes a method of measurement of the transverse process of the seventh cervical vertebra. He has studied these measurements in 400 roentgenograms of the neck and has compared them with the length of the transverse process of the first thoracic vertebra, thus establishing an index which he believes will be of help in determining those conditions that may fall into the category of the scalenus anticus syndrome and be benefited by surgical measures.

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HOWARD L. BROWN M.D.

Björkstén, G. 51 Suture of War Injuries to Peripheral Nerves. *Clinical Studies of Results. Acta chir scand.* 1947 95 Supp. 119.

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GEORGE PERRET M.D.

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mycin therapy was not begun until the seventh day of the disease, after 4 days of ineffective penicillin therapy. The response of the infant to streptomycin was only gradual and there was evidence of residual damage to the central nervous system after treatment. In the period of 7 days before streptomycin was begun there was more than ample time for *Pseudomonas aeruginosa* to have inflicted severe damage on the central nervous system.

In case 3 with *Bacillus proteus morganii* meningitis, organisms disappeared from the cerebrospinal fluid only after the institution of streptomycin therapy, though some clinical improvement had occurred during the preceding period while penicillin and sulfadiazine were being given. Here again the recovery may be ascribed to streptomycin.

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The transient untoward effects of the local use of streptomycin would indicate that the intraventricular and intrathecal routes for the administration of streptomycin should be used with caution. Streptomycin administered by the intrathecal and intramuscular routes would seem to be the drug of choice in the treatment of meningitis due to these gram-negative bacilli. HOWARD H. LASKER, M.D.

Craig, Winchell McK. and Abbott, Kenneth H.: Surgical Considerations in the Treatment of Hypertension. *Ann. Surg.* 1947 125 662.

The surgical treatment for the relief of hypertension has passed through the stage of radical rhizotomy into that of extraspinal resection of the splanchnic nerves and the thoracic and lumbar sympathetic ganglia and trunks.

Classification and grouping of the disease has been chosen arbitrarily for a comparison between the medical treatment, on the one hand and various types of surgical procedures, on the other. A satisfactory single criterion for the prediction of successful operations has been developed. It has been agreed that even the most extensive of the operations cannot change the clinical status of the hypertension which has advanced to the degree of irreversible changes in the vessels of the heart, kidneys, brain and other organs.

The nature of the operation is physiologic rather than pathologic and the results depend on the physiologic response of the vascular system. All types of sympathectomy and splanchnicectomy have been followed by arrest of the progress of the disease and alleviation of symptoms. Although it is true that the more extensive operations have resulted in greater denervation of the vascular system they also result in a more extensive cutaneous area of innervation.

sweating which produces discomfort to the patient in adjusting himself to climatic changes, and further discomfort because of excessive sweating in the unaffected areas.

Newell, John L. and Smithwick, Reginald, H.: Pregnancy following Lumbodorsal Splanchnicectomy for Essential and Malignant Hypertension and Hypertension Associated with Chronic Pyelonephritis. *N. England J. M.*, 1947 326-331

Pre-existing hypertension with or without renal disease makes for a poor prognosis in pregnancy both for the mother and the child. Pregnancy is considered to accelerate the progress of these diseases. Severe hypertension is considered by many to be an indication for therapeutic abortion.

The present article is based on 14 cases of arterial hypertension with blood pressures averaging 196 systolic and 130 diastolic. Prior to splanchnicectomy the blood pressures of these patients were studied during the ensuing pregnancies and at 6 weeks post partum. In one case, the splanchnicectomy was performed during the first trimester. Following the splanchnicectomy the average blood pressures, prior to the pregnancies, averaged 135 systolic and 87 diastolic; only 4 patients had persistent albuminuria.

The diagnosis of the hypertension was as follows: the condition in 7 patients was classified as essential hypertension, in 3 as essential hypertension and associated chronic pyelonephritis; 3 patients developed both hypertension and pyelonephritis during their first pregnancy; there were 3 cases of malignant hypertension with pyelonephritis in 2. In all the cases hypertension antedated the pregnancies under discussion and in 3 cases previous pregnancies were interrupted because of hypertension.

In 9 cases the blood pressure remained within normal limits during pregnancy without albuminuria. In the other 5 there was very little change in blood pressure until the third trimester. In one of these, a four plus albumin necessitated interruption of the pregnancy at the thirty-fourth week. There is a complete clinical record of each patient. It seemed to the authors that it would be most unlikely for the majority of these patients to have had living children without severe cardiovascular damage unless the splanchnicectomy had been performed. It appears that after a satisfactory response, a carefully supervised pregnancy is safe and permissible and arrangements may even be extended to include cases of malignant hypertension which would otherwise be extremely hazardous.

ANDREW VICK BROOKHUIS, M.D.

He believes that in the majority of cases the diagnosis of intraocular neoplasm offers no special difficulty but that certain tumors are difficult to differentiate from primary glaucoma idiopathic retinal detachment, choroidal detachment senile macular exudative retinitis, hydatid cyst, benign melanoma localized inflammatory conditions, and secondary tumors. He believes that in addition to a thorough history and complete examination of the eyes, certain points are of help in making the diagnosis. A detachment secondary to a tumor does not have a retinal hole pigmented cells in the anterior chamber may indicate an intraocular tumor. Among these cases the intraocular pressure was elevated in 50 per cent and low in 3 per cent. However, other series were not as consistent. The author thinks that the use of the scleral puncture, scleral flap and exploratory needle are unjustifiable.

Aids in diagnosis of the more difficult iris sarcoma were its limitation of the iris motility its preference for the lower quadrants, its greater tendency to rise above the iris level and its encroachment on the iris angle. Intraocular sarcomas are most common in the choroid less frequent in the ciliary body and rare in the iris. Bilateral sarcoma is extremely rare. In the choroid the tumor begins in the stroma, spreading between Bruch's membrane and the sclera. It then breaks through Bruch's membrane and expands rapidly into the vitreous forming the collared stud appearance with its central constriction. The tumor also tends to follow the perforating channels of the sclera into the orbit, and to metastasize by the blood stream.

The author uses the pathological grouping of spindle cell round cell, spindle and round cell epithelioid cell and mixed cell types. The spindle cell type was the most common and the epithelioid cell type was rare. The mixed cell tumors were made up of all these types of cells and were the most fatal. The choroidal sarcomas were extremely vascular and were occasionally ossified. The origin of the melanoblasts is still undecided but the author believes they are of both epiblastic and mesoblastic origin. He believes that the malignant melanoma is of mesodermal origin and therefore a true sarcoma.

The mortality rates showed that 27.9 per cent of the patients had died of sarcoma at the end of 3 years, 35.8 per cent in 5 years, and 55.5 per cent in 10 years. The author found that the patient was quite safe after 10 years. Intraorbital extension increased the mortality rates but involvement of the optic nerve or venous outlets did not. Patients under 30 years of age had a better prognosis. The author's findings tended to substantiate those of Callander and Wilder in that the patients with large amounts of reticulum throughout the tumor had a good prognosis.

The eye and the tissues immediately behind it should be removed as soon as the diagnosis has been made. In those cases of known extraocular spread, the statistics did not show any better results with exenteration than with radiation therapy. If the growth is in the patient's only eye or if the patient refuses to

have the eye removed the author suggests the implantation of radon seeds into the growth or an iridectomy in the case of an iris tumor.

ROBERT H. JOHNSON M.D.

Weekers, L.: Adhesive Episcleral Reaction in the Operative Treatment of Retinal Detachment. *Brit. J. Ophth.*, 1946 30 715

The author emphasizes the desirability of producing an adhesive episcleral reaction as well as an adhesive chorioretinitis in the operation for the correction of retinal detachment.

An incision was made through all layers of the eyes of rabbits and of human beings prior to enucleation with a very thin small cataract knife. Subsequent histological examination revealed the episcleral tissue to have entered the scleral incision and to have formed a union with the retina, which prevented a postmortem detachment at the points of perforation although the retina was elsewhere detached. This was true even when the eye was enucleated as short a time as 3 or 4 days after the puncture. Healing of the sclera itself was found to be slight or negligible.

From these experiments the author concludes that the episcleral reaction should be striven for in cases of retinal detachment to assist in holding the retina in position. This can be accomplished only if the sclera is completely perforated. While this can be most readily accomplished by a cataract knife it involves some risk of hemorrhage. The author therefore uses an ordinary angled and insulated diathermy needle 2 mm. in length and 0.15 mm. in diameter and leaves the current on while inserting and removing the needle the entire procedure requiring less than a second for each puncture. There should be no loss of subretinal fluid. The author favors the use of the nonperforating diathermic electrode prior to the perforations to promote a wide area of adhesive chorioretinitis. Following the multiple diathermic punctures the subretinal fluid should be evacuated. For this the galvanocautery is preferred several short applications being made at the same spot and exploration with a lacrimal probe is done if necessary.

WILLIAM A. MASON M.D.

Levatin P.: Atrophy of the Optic Nerve following Hemorrhage. *Arch. Ophth.*, Chic. 1947 37 18.

Amblyopia following an acute loss of blood occurs but rarely, an average of one case a year having been reported for the past 25 years. It seems probable that the pathogenesis of the condition lies in degeneration of the ganglion cells of the retina as a result of the ischemia, although there are numerous objections to this theory. In addition to the effect upon the ganglion cells there may be direct destruction of the optic nerve fibres in the region of the lamina cribrosa.

In the case reported by the author there was a massive hemorrhage from a duodenal ulcer in a 34 year old white man with reduction in hemoglobin to 25 per cent, with little improvement in the blood picture for 13 days, due to continued bleeding in spite

SURGERY OF THE THORAX

CHEST WALL AND BREAST

Piccolo V and Golsis, M: Histological Notes on Fibrocystic Mastopathy before and after Treatment with Male Sexual Hormone (Rilievi istologici nella mastopatia fibrocistica prima e dopo trattamento con ormone sessuale maschile) *Tumori* Milano 1946 32 175

The efficacy of testosterone propionate in chronic mastitis, periodical painful breast and menstrual and menopausal disorders was first observed by Demarest and Capitain in 1937. The excellent results with sexual hormones obtained in a case of mastopathy with hyperfolliculnemia led the authors to try it in 17 more patients. In 16 of them the testosterone acetate caused the pain to leave and arrested the progress of the illness. In 1 case only the results were not satisfactory possibly because the patient was old and the mastopathy had been present for many years. Premenstrual monthly doses of from 30 to 90 mgm. were given for a few months. The results obtained by Demarest and Capitain were soon confirmed by others (Turpault, Loeser, Mighavacca, Borghetti,) so that today the use of male sexual hormones is almost specific in cases of fibrocystic mastopathy in the female.

Various authors who have interested themselves in this problem have reported a diminution or disappearance of the adenomatous and cystic nodules and cessation of pain. However no one has confirmed the results with histopathological studies.

This the authors have done and in this article they report the clinical and histopathological results in the mammary gland before and after treatment with testosterone propionate (perandren). A biopsy of the gland was taken before and after the treatment was started and the treatment consisted of 25 mgm. per dose until a total of 125 mgm. was reached. After 2 months more tissue was removed for microscopic study. The tissue was removed for an area distant from the previous biopsy site to eliminate traumatic reactions. In some cases a third microscopic examination was made. Following a histopathological discussion of the biopsy specimens before and after the treatment with perandren the authors state that there was a reduction of the epithelial elements and of the cystic formations, and an increase of the connective tissue elements leading to compression and almost strangulation of the epithelial elements. These changes namely coarctation and individualization of the lobules, a tendency toward or complete disappearance of the cysts and reduction of the tubules of the Mantel gewebe are more marked in tissues removed 3 or 4 months after the treatment. Tissue removed from 1 to 2 months after the treatment shows intermediate changes. The ultimate conclusion is that testosterone propionate causes a gradual fibrosis and involution of the epithelial elements, an action which is antagonistic to the hyperplasia of the elements of the mammary gland. The authors acknowledge that some authors have obtained opposite results, namely a marked



Fig. 1. Before treatment. Hyperplastic cystic proliferation of medium grade



Fig. 2. One month after treatment. Beginning involution with reduction of the "Mantel Gewebe."



Fig. 3. Three and one-half months after treatment. Fibrosis of the Mantel Gewebe and marked involution of the glandular elements with dispersion. Typical involution.

increase of the epithelial elements and of the connective tissue, and they mention the antineoplastic action of the male hormones (as reported by Prudente and others) which is explained by endowing the male hormones with an action antagonistic to the estrogens.

The authors believe that continuous treatment with androgens may lead to masculinization of the female breast for the same reason that treatment with folliculin has caused gynecomastia in the male.

The dosage of the male hormone depends on the amount of folliculin present in the patient; therefore, some method of computing its amount in the blood should be established. Large doses of perandren are recommended in order that the fibrocystic breast may be kept under the favorable influence of this hormone.

JOSEPH M. A. PARK, M.D.

Mattina, M.: Considerations on the Late Results of Post-operative Roentgen Therapy of Cancer of the Breast. (Considerazioni sui alcuni risultati a distanza della Roentgenterapia post-operatoria del carcinoma mammario). *Gior. med.*, Palermo, 1946, 3, 371.

The author compares the results obtained in a group of 22 patients with carcinoma of the breast subjected to postoperative roentgen therapy during the years 1938 and 1939, with the results in another group of patients (10) operated upon during 1943 and unable to undergo x-ray therapy because of the exigencies of the war. The results show a diminished mortality in the patients of the first group as well as fewer recurrences (26%) as compared to the recurrences in the second group (60%).

The conclusions of the author are as follows:

1. It is a necessary and indispensable part of the surgical cure to subject all patients with carcinoma of the breast beyond the first stage of Stenhal to postoperative irradiation soon after the healing of the incision. Delayed healing of the incision is not a contraindication to start irradiation.

2. Of the different techniques in vogue the one of Perussia is recommended. This consists of irradiation given in one series of from 2 to 3 weeks' duration with administration in one area only of 2,500 to 3,000 roentgens at a focal distance of 60 cm.

3. The methods of Winta, Palmeri and Holdfelder which require various series are to be used only when the technique of Perussia is contraindicated.

JOSEPH M. A. PARK, M.D.

TRACHEA, LUNGS, AND PLEURA

Di Rienzo, S.: Bronchial Dynamics. Its Roentgenologic Manifestations (Dinamismo bronchiale. Sue manifestazioni radiologiche). *Bol. Inst. dia. ginec.* B. Air, 1946, 2, 45.

In addition to anatomic features bronchi also possess dynamic characteristics which may easily escape detection not only in a cadaver but also in vivo during the bronchoscopic examination. Such dynamic factors can be studied best after the introduction of an opaque medium into the bronchi.

Bronchial dynamics depend on 3 anatomic structures: muscular fibers, elastic fibers, and terminal nerve fibers. Smooth muscular fibers form functional radicular and alveolar sphincters.

The play of contractions in lobular bronchi is not continuous but rhythmic, corresponding to respiration. During roentgenoscopic examination the continuous progress of contractions of the large air passages can be differentiated from the rhythmic movements of the smaller branches. The opaque column which advances during inspiration recedes during expiration under normal conditions, while in presence of pathologic lesions the movements may be absent or reversed.

Not infrequently bronchoscopic and roentgenologic findings contradict each other. The author cites an observation in a patient in whom the bronchography furnished negative results but repeated x-ray examinations after the introduction of an opaque medium into the bronchi established the diagnosis of malignancy.

Typical findings may be elucidated in asthma because the normal inspiratory impulse is absent.

Functional sphincters are responsible not only for physiologic reduction of the size of the bronchi but also for pathologic constrictions.

The muscular fibers surrounding the bronchi are innervated by the extrachondral subchondral, and subepithelial plexus. The fibers of the first mentioned plexus derive from the sympathetic system, while the fibers of the other two plexus formations come from the pneumogastric system.

Various local and general factors may influence the tone of the bronchial sphincters.

Cessation of normal dynamics of the bronchi with the resulting retention of the opaque medium is most frequently observed in bronchial cancer.

Various changes of normal bronchial dynamics may suggest nonexisting anatomic lesions and the employment of wrong therapeutic measures and therefore a knowledge of the various alterations of the bronchial dynamics is essential for diagnosis and proper therapy.

JOSEPH E. NARAY, M.D.

Fojanini, Giuseppe: Multiple Successive Abscesses of the Lung. Clinical Study (*Ascessi multipli successivi del polmone. Contributo clinico*). *Arch. Ital. Chir.*, 1947 34 3

Multiple abscesses of the lungs can be divided into two groups: simultaneous or synchronous and successive. Various stages of evolution may be found in the second group. Septic or pyemic processes of embolic nature may produce pluricentric suppurative lesions in both lungs. After the primary abscess has taken a normal course for some time, complications arise in the form of a rise of temperature, pain in the chest, vomiting and increased expectoration. Especially the last mentioned sign suggests a clinical search for multiple abscesses and a roentgenologic checkup.

The author reports 8 cases of successive pulmonary abscesses. One patient ultimately recovered, the condition of 3 improved, 2 patients were left with a bronchial fistula, and 3 succumbed to the condition. From 3 to 19 months elapsed between the appearance of the first and second abscesses. Some patients recovered under conservative treatment while others require surgical intervention.

It cannot be definitely stated whether successive pulmonary abscesses may be considered exclusively as intrapulmonary metastases of the primary abscess. Dissemination of infection may originate from an extrapulmonary focus. Bronchogenic, lymphatic, and hematogenous paths of spread of the infection must be considered. The infection may invade the lungs by contiguity from suppurating lymph glands. Usually secondary abscesses develop after the primary abscess has ceased to provoke vomiting; therefore spread of infection by aspiration of the infected masses cannot be of great importance.

In order not to overlook the development of a successive pulmonary abscess the author advocates periodic x-ray studies at 15 day intervals.

The prognosis is not as bad as is generally assumed. Some abscesses may regress spontaneously, others yield to medical treatment while some must be attacked surgically. If no improvement is recorded after from 4 to 6 weeks of conservative treatment surgical intervention is indicated.

JOSEPH E. NARAY, M.D.

Blizard, J. Dewey and Swenson, S. A., Jr: Bilateral Lobectomy for Bilateral Bronchiectasis. *Arch. Surg.* 1947 54 483

The authors record 4 cases of bilateral bronchiectasis in which cure was obtained by bilateral lobec-

tomy. In all patients the lower lobes of both lungs were removed and in 1 patient the middle lobe of the right lung was also excised. In all but case 2 the patients are entirely free from symptoms. In case 2 there is some residual cough and sputum because the middle lobe of the right lung and the lingua of the upper lobe of the left lung are bronchiectatic, and the disease remains because it was not recognized prior to and at operation.

Eight operations and 9 lobectomies were performed in the 4 cases—all by intralobar dissection and the individual ligation technique, with intratracheal cyclopropane anesthesia and frequent intratracheal aspirations. In 2 cases bronchopleural fistula with empyema developed in each case after the first stage of operation, and in both cases the fistula closed spontaneously after drainage of the empyema. There were no deaths in this small series.

Removal of two major lobes either total pneumonectomy or bilateral lobectomy reduces the amount of lung tissue available for respiratory function so drastically that the cardiorespiratory capacity must be critically evaluated before each operation. It is interesting that in 3 of 4 cases the resections did not cause reduction in vital capacity but, on the contrary, produced sizable increases. Apparently the bronchiectatic lobes were relatively functionless. This is understandable in cases in which the diseased lobes are small, contracted, atelectatic, functionless masses. After lobectomy the residual normal lobes become emphysematous and apparently develop some increase in respiratory capacity. To realize fully the benefits of this compensatory change 3 or more months should be allowed between stages of operation. Probably the principal factors responsible for increasing respiratory capacity are the elimination of infection and of coughing and their interference with respiratory efficiency. The reduction in cardiac and respiratory reserve which occurs with aging limits the use of bilateral lobectomy to children and young adults, a younger age limit than that for unilateral lobectomy.

In no other type of surgical case does a successful outcome depend so much on constant observation and vigilant attention to details of preoperative, operative, and postoperative care. These patients had the constant attention of special nurses trained to encourage coughing and alert to any interference with a free airway. A resident surgeon skilled in tracheobronchial aspiration was always immediately available. The hemoglobin and the red cells were maintained at normal levels by the liberal use of blood transfusions before, during and after operation. The tracheobronchial tree was kept free of sputum as completely as possible by postural drainage before operation and by frequent tracheobronchial aspirations during and after operation. Chemotherapy was utilized prior to and after operation, first, with the sulfonamide drugs and later with penicillin, when it became available. Oxygen was administered in a tent as long as the patient felt that it was beneficial.

A remarkable importance is the fact that all the patients are enjoying not only good health but normal lives, which the cough previously denied them. The x-rays have assumed schooling and the maiden was married. Four case histories are given in detail.

JOHN J. MATOKEY M.D.

Weldmann, Roger E.; Clagett, O. Theron; and McDonald, John R.: Amyloid Disease of the Lung Treated by Pneumonectomy. *J. Thorac. Surg.* 1947 15 369.

Amyloid disease, other than the commonly recognized typical form secondary to a chronic debilitating disease, is now being recognized as a clinical and pathologic entity. It may occur in a more or less generalized distribution or may be localized to a portion of an organ, particularly in the connective tissue elements and walls of the blood vessels of the involved structure.

Deposits of amyloid substance which form localized nodular masses or infiltrations, although uncommon, may simulate other pathologic lesions and require surgical removal of either a portion of the organ or the entire organ.

The mechanism of elaboration of this abnormal intracellular material in localized masses is not known and no evidence exists thus far that resection of the deposits occurs either spontaneously or under the influence of conservative therapeutic measures.

A case of localized amyloid disease involving the main bronchus, its branches, and the corresponding branches of the pulmonary vessels at the root of the right lung, was reported in the original article. Pneumonectomy was performed after thorough study in an attempt to establish the cause of the repeated attacks of hemoptysis.

Localized amyloid disease, particularly in the respiratory tract, can be responsible for sufficient alteration in the anatomy and physiology of the involved organ to be of clinical importance. In this case the clinical picture was essentially that of an interstitial lung disease, low grade obstructing lesion of the main bronchus or its branches at times associated with brief episodes of hemoptysis and with the absence of the presence of a debilitating chronic disease. That the process did not progress to persistent bronchostenosis was probably due to the absence of a significant degree of pulmonary emphysema or pulmonary aneurysm distally. The history of the patient indicated that some impairment of function and drainage of the middle and lower lobes of the right lung had been present for

bronchial branch. Furthermore, the loss of the cilia of the surface epithelium overlying the amyloid process in the main bronchus and its branches suggested that a physiologic obstruction to the normal flow of bronchial secretion was present. There was no evidence of bronchial ulceration when the lung was examined in the laboratory. The source of the bleeding which resulted in the symptoms or produced the clot in the bronchial branch to the lower lobe, noted by the bronchoscopist, was best explained on the basis of extravasation from small or medium sized bronchial blood vessels, the walls of which had been largely replaced and weakened by the amyloid deposits.

The roentgenograms did not suggest hilar infiltration in this case. This is especially remarkable in view of the fact that some degree of calcification was present in the mass.

Deposits of amyloid substance in tissues frequently are described in the literature as being grayish translucent masses which yield a characteristic color reaction when iodine is applied to their cut surfaces. In this case the gross picture did not show this classical picture and did not suggest a typical form of such lesions. The extremely tough, leathery consistency of the mass, as noted by both the surgeon and the pathologist, was of much more significance in the recognition of the nature of the process.

The staining characteristics of the amyloid substance are of considerable aid to the surgical pathologist in establishing prompt positive identification.

Moody James D. Trent, Josiah G., and Newton, George W.: An Endobronchial Balloon for the Control of Bronchial Secretions during Lobectomy and Pneumonectomy. *J. Thorac. Surg.* 1947 15 358.

A double-lumen balloon suction catheter for the control of bronchial secretions during lobectomy and pneumonectomy is described. Its successful use in 22 lobectomies and 5 pneumonectomies in dogs demonstrates that (1) no harmful effects are produced, (2) complete occlusion of the bronchus is obtained, (3) dislodgment during operation is very unlikely, (4) a wide margin of safety is present, and (5) there is little interference with anesthesia.

Clinical trials are now under way and will be reported later. It should be understood that this instrument has been designed for use only in pneumonectomies or lower lobectomies and not in upper lobectomies. Experimental studies are now being carried out on a similar instrument constructed primarily for use in upper lobe resections.

authors. She has had pains in the left side of the chest for 18 years. On quite numerous occasions dyspnea on exertion appeared. From time to time the patient vomited and the expelled liquid contained echinococcus cysts.

An operation was performed under general anesthesia. The postoperative period was complicated by a pulmonary complication involving the right lung. Cysts were found in the sputum. A shadow presumably caused by a cyst was found in x ray pictures of the right lung before and after the operation.

Echinococcus invasion of the pericardium may be recognizable microscopically in some instances, while in others only a histologic examination will lead to the correct diagnosis.

In numerous cases reported in the literature the invasion of the heart and pericardium was combined with similar conditions in the viscera but in the author's case only a concomitant lesion of the lungs was found. In many instances numerous adhesions in the pericardium are caused by the invasion of echinococci. As a rule it is not necessary to drain the pericardial sac through the pleural cavity.

JOSEPH K. NARAT, M.D.

Amarigós, A.; Ugón V. Armand; Larghero, P. and Di Bello R.: Three Cases of Cardiopericardiac Echinococcosis Treated Surgically (Tres casos de equinococosis cardiopericardíaca operados) *Boletín de Uruguay* 1946 17 504.

Two hundred cases of echinococcus disease of the heart and pericardium have been collected by the authors from the literature. Six of the patients were operated on.

The differential diagnosis must consider osteoaroma of the ribs and aneurysm of one of the intercostal arteries if an intercostal tumefaction is present.

The authors report 3 cases of echinococcus invasion of the heart and pericardium. In all 3 a characteristic, deep inversion of the T wave in the electrocardiogram was found. Similar alterations of the tracings were found by other writers. The authors express the opinion that such changes in electrocardiograms alone or in combination with other clinical and laboratory findings are of great diagnostic value.

The 3 patients operated on by the authors offered anatomopathologic findings corresponding to various stages of evolution of the condition localized primarily in the myocardium and spreading gradually to the pericardium. In the first case an exudative fibrinopurulent pericarditis with a fibroplastic reaction of the parietal pericardium was found. In the second case a similar process was combined with the presence of floating intact vesicles. Roentgenographic studies revealed circular shadows caused by the presence of secondary vesicular echinococcus formations. This form corresponds to a rupture of hydatidiform cyst of the liver while the first type may be compared with a chronic hydatidiform choleperitonitis with a small amount of exudate in which residues of membranes but no intact vesicles float. In the third case multivesicular secondary echinococcus le-

sions were found. This type may be compared with similar specific supramesocolic and subhepatic conditions in the abdomen. While in the second case the evolution took 4 months it was of not less than 8 years' duration in the third case.

The first 2 patients recovered from the operation while the third succumbed to a secondary infection 30 days after the operation. In the first patient the lesion produced a pulsating intercostal tumefaction with cystic expansion.

In the first type in which no fertile hydatidiform formations are present, simple evacuation is indicated. In the second type with intact cysts and effusion an incision and evacuation of the cysts should be performed while in the third type without effusion but with secondary multivesicular cysts, a complete evacuation of the formations and an injection of formalin are suggested. In the first type a drain is not necessary or if one is inserted it should be removed not later than from 24 to 48 hours after the operation.

JOSEPH K. NARAT, M.D.

ESOPHAGUS AND MEDIASTINUM

Garlock, John H.: Technical Problems in the Surgical Treatment of Carcinoma of the Esophagus and Upper Stomach. *J Thorac Surg* 1947 16 315.

Based on the experience with more than 200 cases, the author summarizes some of the advances in technique and over all management of surgery for carcinoma of the esophagus and upper part of the stomach. They may be enumerated as (1) careful preoperative preparation (2) expertly administered anesthesia, (3) atraumatic surgery with minimal loss of blood, free exposure and accurate suture methods, and (4) careful attention to many details of postoperative care.

The preoperative preparation aims at adequate correction of dehydration, avitaminosis and disturbances of the protein metabolism and mineral components.

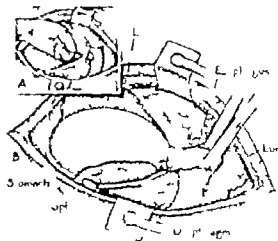


Fig. 1 (Garlock) Mobilization of the lower esophagus and stomach. Lesion is located at the cardia.

Its removal ordinarily is a simple procedure, but may be rendered difficult as a result of perforation into a bronchus, inflammatory fusion with the hilar structures or pericardium or malignant extension.

The neurofibroma, being a solid tumor and located in the posterior mediastinum, is subjected to unequal pressure from the vertebrae and ribs on one side and the yielding mediastinal tissue and pleura on the other. Hence this type of tumor becomes flattened on one side to conform to the surface of the costo-vertebral gutter in which it usually lies. This solid slowly growing tumor may spread the ribs or produce erosion as a result of long continued pressure. The removal of a small neurofibroma is neither difficult nor dangerous. The long neglected tumor, however, may cause paralysis or irreversible structural deformity, the condition becoming incurable.

The congenital cyst may be discovered at any age. The symptoms may be very vague, and the diagnosis may be made on x ray examination or at autopsy. Suggestive symptoms are substernal pressure, cough, swelling of the neck, and pain in the left chest and arm. Dyspnea and pleurisy may occur. Cough productive of blood, pus and hair may occur. Physical signs are usually absent, although dullness over the site of the tumor may occur.

With neurofibromas, backache, mediastinal pressure, pain, deformity of the thorax, exertional dyspnea, and evidence of obliteration of the subclavian artery may occur.

Since a diagnosis can rarely be made from the clinical findings alone, adequate x ray examination should be made early. It is important to include fluoroscopy with barium visualization of the esophagus,

posteroanterior stereoscopic films of the chest, a lateral film, and a film to record bony detail.

The dermoid cyst and the teratoma usually lie in the anterior mediastinum, while the bronchial cyst and the neurofibroma are located in the middle or the posterior mediastinum. All may project into either the right or left pleural cavity. The dermoid cyst and the teratoma vary in size from 1 cm. to 20 cm. in diameter. They are single, well circumscribed tumors. They often show calcification in the walls, and portions of teeth and irregular bone spicules within the tumor. Differentiation must be made from echinococcus cysts, which may show intramural calcification, but no teeth or bone.

Six cases are reported: 1 dermoid cyst, 1 teratoma, 1 bronchial cyst, 1 ganglioneuroma, and 2 neurofibromas. The operation in each case was done under gas oxygen-ether intratracheal anesthesia. A posterolateral, anterolateral or midsternal thoracotomy incision was used, according to the location of the tumor and the probability of the best exposure in each case. After operation the thoracic wound was closed tightly about an intercostal catheter placed into the pleural cavity for drainage, following re-expansion of the lung. The catheter was kept on suction drainage (13 cm. negative pressure measured in water) until serous pleural effusion ceased, about the third or fourth postoperative day. Fine silk was used for the ligature and suture material.

Since the tumors are potentially dangerous, their early discovery through annual chest roentgenography of the population is recommended, and their early operative removal is urged.

SAMUEL KAHN, M.D.

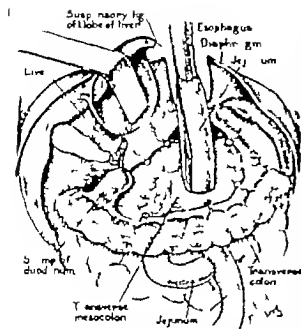


Fig. (Garlock) Diagrammatic representation of the completed operation of total gastrectomy performed through a combined abdominothoracic incision and showing the Y-anastomosis of the jejunum. About 8 inches beyond the duodenojejunal junction the jejunum and its mesentery has been divided. The distal end is brought through an opening in the mesocolon and sewed to the opened end of the esophageal stump in the usual manner. The proximal end of jejunum is implanted end-to-side into the distal portion below the mesocolon.

Anesthesia includes routine tracheal intubation and careful removal of tracheobronchial secretions.

The problems in surgical technique vary to some extent with the location of the carcinoma.

In midthoracic carcinoma, preservation of an intact blood supply to the mobilized stomach is obviously important. The upper esophageal stump likewise poses a similar problem because of its probable meager blood supply and advice against excessive mobilization of its upper segment is sound. The left gastric artery can be sacrificed safely. Further mobilization of the stomach can be secured by dividing the gastroepiploic omentum if the gastroepiploic vascular arch along its greater curvature is preserved.

Exposure is secured by an incision in the sixth intercostal space with division of the fourth, fifth, sixth, seventh, and eighth ribs near the spine. The phrenic nerve is routinely crushed. The anastomosis between the stomach and esophagus is made in two layers with interrupted nonabsorbable sutures, the stomach being telescoped over the suture lines. The stomach is suspended from the chest wall and the diaphragm is carefully closed around the stomach. Two instances of herniation are mentioned.

In carcinoma of the lower one-third of the esophagus and cardia of the stomach, the specimen obtained by esophagoscopy biopsy is credited with defining the origin of the carcinoma, squamous cell tumors arising in the esophagus and adenocarcinomas being believed to represent primary gastric neoplasms.

The operative exposure is secured through a combined abdominothoracic incision. With the patient in lateral position an upper left rectus incision is made and operability through it is determined. If suitable, the incision is extended upward and then outward in the eighth intercostal space to the vertebral border of the scapula or beyond. The chest is opened and the diaphragm incised radially from the esophageal hiatus. This approach permits accurate handling of the esophagus from the aortic arch down and of all of the stomach, as well as of the spleen and tail of the pancreas, if necessary. The wound is closed in layers, with pericostal sutures, and the pleural cavity is drained by catheter.

In total or extensive gastric resections, an esophagojejunostomy has proved very satisfactory especially the "Y" anastomosis of Roux. A jejunostomy for early feeding is used being made prior to abdominal closure.

Postoperatively an oxygen tent adequate sedation, parenteral penicillin and care exercised to insure complete pulmonary re-expansion are essential.

Jejunostomy feedings may be started promptly but oral feedings are begun on the fourth day. Transfusions are used as indicated.

HIRSH T. LARSEN, M.D.

Slivens, Esther and Adams, Ralph: Benign Mediastinal Tumors: A Report of 6 Cases with Analysis of Diagnostic Criteria and Advocacy of Surgical Removal. *Surg. Clin. A. America*, 1947, 37, 506.

Mediastinal tumors are not rare and are believed in many instances to be congenital anomalies such as dermoid cysts, teratomas, and bronchial cysts. The most common mediastinal growth is the neurofibroma. The congenital tumors and the neurofibroma (and ganglioneuroma) exhibit several similar clinical features. They are round or ovoid in shape. They originate in the mediastinum, close to the midline. As they grow larger, they extend laterally against the lung, or anteriorly or posteriorly against the heart and thoracic wall with associated pressure phenomena. There are, however, differences of behavior between the cystic and solid tumors.

The cyst is round on fluoroscopy. It may show a slight change in configuration with change in the patient's position. The rate of growth of the benign cyst is slow and erosion of the surrounding structures does not occur. Such a cyst occasionally enlarges very rapidly because of accumulation of fluid within infection or malignant degeneration and it is for these reasons that it is potentially dangerous.

Its removal ordinarily is a simple procedure but may be rendered difficult as a result of perforation into a bronchus, inflammatory fusion with the hilar structures or pericardium or malignant extension.

The neurofibroma, being a solid tumor and located in the posterior mediastinum, is subjected to unequal pressure from the vertebrae and ribs on one side and the yielding mediastinal tissue and pleura on the other. Hence this type of tumor becomes flattened on one side to conform to the surface of the costo-vertebral gutter in which it usually lies. This solid slowly growing tumor may spread the ribs or produce erosion as a result of long continued pressure. The removal of a small neurofibroma is neither difficult nor dangerous. The long neglected tumor, however, may cause paralysis or irreversible structural deformity, the condition becoming incurable.

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Six cases are reported: 1 dermoid cyst, 1 teratoma, 1 bronchial cyst, 1 ganglioneuroma, and 2 neurofibromas. The operation in each case was done under gas-oxygen-ether intratracheal anesthesia. A posterolateral, anterolateral, or midsternal thoracotomy incision was used according to the location of the tumor and the probability of the best exposure in each case. After operation the thoracic wound was closed tightly about an intercostal catheter placed into the pleural cavity for drainage following re-expansion of the lung. The catheter was kept on suction drainage (15 cm. negative pressure measured in water) until serous pleural effusion ceased about the third or fourth postoperative day. Fine silk was used for the ligature and suture material.

Since the tumors are potentially dangerous, their early discovery through annual chest roentgenography of the population is recommended, and their early operative removal is urged.

SAMUEL KAHN, M.D.

SURGERY OF THE ABDOMEN

ABDOMINAL WALL AND PERITONEUM

Harper, Fred R.: Thoracoabdominal Approach to Upper Portion of Abdomen and Upper Pole of Kidney. *Arch. Surg.* 1947 54 517

In this article the technical feasibility of traversing the diaphragm is discussed and a surgical technique is presented. With the aid of illustrative cases it is shown how such an approach gives a better understanding of some of the lesions encountered in the region of the diaphragm.

The patient is placed on the operating table in a true lateral position with the left side up. Endotracheal anesthesia induced with a nitrous oxide-oxygen-ether mixture is used. The incision is made over the ninth rib and extended from the angle of the rib to the anterior margin of the costal arch. The ninth rib together with its costal cartilage is removed subperiosteally and the thorax is opened through the periosteal bed. The thoracic cavity is then explored and any adhesions to the diaphragmatic pleura are divided. It is well at this time to divide the pulmonary ligament and crush the phrenic nerve. The costal arch is then divided and the edge of the diaphragm picked up to start the incision through this structure. It is split from its costal edge to the esophageal hiatus. Rib spreaders are then inserted which open the incision sufficiently to give adequate exposure to the structures from the pylorus of the stomach to the arch of the aorta. It is necessary to

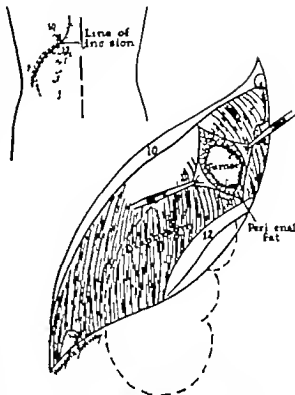


Fig 2. Drawing illustrating transdiaphragmatic retroperitoneal approach to the adrenal gland and the upper pole of the kidney

divide the peritoneal reflection from the cardia of the stomach and the lower end of the esophagus. At the completion of the operation the diaphragm is closed with two rows of interrupted cotton or silk sutures, and the thoracic incision is closed in the usual manner with interrupted cotton sutures. In most cases it is not necessary to use suction drainage but in cases in which an anastomosis has been made between the stomach and the esophagus it is advisable. An oxygen tent is used routinely for 24 to 48 hours after operation. After that the patients are allowed to get out of bed.

Carcinoma of the cardiac end of the stomach and the lower portion of the esophagus requires good exposure for adequate resection of both organs. With the incision just described the resection and anastomosis of the organs can be made with ease under direct vision. Bleeding is easily controlled and the split diaphragm can be sutured to the stomach at the desired level.

Esophagogastrectomy has two very distinct advantages over total gastrectomy and esophagojejunostomy in that the resection is more complete and the operation is more physiologic as two thirds of the stomach can be saved.

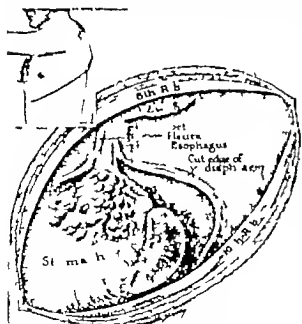


Fig. (Harper). Drawing illustrating the exposure obtained from the thoracoabdominal approach

16 SURGERY OF THE ABDOMEN

The thoracoabdominal approach is ideal for the exploration and repair of large hiatal diaphragmatic hernias. The abdominal approach to these hernias is more difficult and less advantageous. The same can be said for diaphragmatic hernias that are associated with peptic ulcer or achalasia of the esophagus.

The transdiaphragmatic approach is also the ideal one for retroperitoneal organs lying below the diaphragm such as the adrenal gland and the upper pole of the kidney. In a case of a tumor of the adrenal gland this approach was found to be simple and it eliminated considerable manipulation of the tumor with the possible consequent danger of a rapid rise in blood pressure as a direct result of such manipulation.

In the discussion, GALT stated that one must not overlook the added difficulties and possibilities of complications in this combined operation. When the thorax is opened respiration must be kept under control in order to have a clear view of the operative field. This demands a well trained anesthetist. Also there is the problem of re-expanding the lung and obliterating the dead space as rapidly as possible to forestall infection, atelectasis and pleural effusion.

With the proper personnel this approach has advantages far greater than the abdominal approach. The casual operator however finds it extremely difficult to expose this area. The site of incision will vary according to the habitus of the patient. In the pyknic patient it will probably have to be placed higher whereas in the asthenic type it may be 1 or 2 ribs lower.

Dorjoo A. Dermoid Cyst of the Mesentery (Sullivan)
Ann. Ital. Chir. 1947
 24, 82

The author describes a case of dermoid cyst of the mesentery. Up to the present time only 50 cases have been recognized. Stressing the diagnostic difficulties, he affirms the possibility of an exact diagnosis by means of an accurate clinical examination and roentgenological findings.

A 38 year old male patient entered the hospital following a diagnosis of cholecystitis. He complained of cramplike pain of the epigastrium which radiated to the umbilical region on the right and toward the back. The pain was not influenced by food or by change in position. After a few days on a diet the condition improved and the patient was discharged. When he again entered the hospital a tumor like mass was found about the size of a large orange, smooth and of hard rubber consistency. It was extremely tender however no fluctuation could be elicited. When the mass could not be felt a flat plate roentgenogram revealed an opaque unrelaxed patient in the right upper quadrant while a barium shadow in the right upper quadrant of the hepatocolic angle enema showed a shadow.

With a preoperative diagnosis of cystic tumor of the mesentery pressing on the colon the patient un-

derwent surgery. The tumor was found to be the size of a full term fetal head of yellow color with a bluish tint. Minute blood vessels were on its smooth surface. The cut section gave the appearance of yellow sebaceous material with hair in a few places. There was a fibrotic sac from 1 to 3 cm in thickness and lined by a smooth mucouslike membrane. Microscopic examination revealed connective tissue with zones of stratified epithelium resembling epidermis hair follicles degenerated epithelium with cholesterol crystals, some hair rarely erythrocytes, and fat.

The patient made an uneventful recovery.
ARMANDO F. CROCOLLA, M.D.

GASTROINTESTINAL TRACT

Tomenius, John Hilding: A Study on the Gastric Sediment. *Acta med. scand.*, 1947 128 Supp 189.

This thesis of nearly 200 pages reviews an attempt to determine whether the pathologic processes which produce alterations in the gastroscopic appearance and functions of the gastric mucosa are reflected in the cytological picture of the gastric sediment and the gastric juice.

The leucocytic infiltration of the gastric mucous membrane and its diagnostic significance is discussed. The literature on the cytology of gastric juice is conflicting largely because acid-digested nondiffused sediment was analyzed by earlier investigators.

The author found that an isotonic (1.3 per cent) solution of bicarbonate dropped into the stomach prevented acid digestion and preserved a more differentiable cytologic picture of the gastric juice. Contamination by salivary esophageal and duodenal secretions was prevented by the use of a special gastric tube.

The cellular elements of the gastric juice were stained by a modification of Giemsa's technique and the cytologic picture was correlated with the clinical picture, the acidity secretion rate, mucous content and the roentgen and gastroscopic findings.

The clinical material comprised 72 cases including normal individuals and patients with chronic gastritis, pernicious anemia, gastric ulcer, duodenal ulcer, gastric carcinoma, leukemia, and miscellaneous conditions.

The patients with chronic gastritis fell into two groups: (1) those with chronic gastritis and acid secretion and (2) those with chronic gastritis and an atrophic mucous membrane without acid secretion. In the latter group the microscopic picture of the sediment resembled that of normal individuals. In the former group the cytologic picture differed directly chiefly by increased cell density and by predominance of the leucocytes.

In the group with duodenal ulcer and duodenal ulcer plus gastric ulcer without gastritis the cytology was normal.

In the group with cancer of the corpus of the stomach there was a marked leucocytic picture but

in patients with cancer of the cardia there were no leucocytes.

The miscellaneous cases showed a sediment like that found in normal individuals.

Edward W. Gross, M.D.

Levin, Edwin; Hamann, Anna; and Palmer, Walter Lincoln: The Effect of Radiation Therapy on the Nocturnal Gastric Secretion in Patients with Duodenal Ulcer *Gastroenterology* 1947 8 585.

A temporary depression of gastric secretory activity in both humans and dogs resulting from the application to the stomach of roentgen rays in sufficient quantity has been shown by many workers. Palmer and Templeton were able to produce a complete achlorhydria to histamine, lasting from a few days to 9 months, in 35 of the 88 cases studied. In the present article the authors report the effect of radiation therapy on the nocturnal secretion in patients with duodenal ulcer.

Twenty-eight patients suffering from radiologically demonstrable, active, uncomplicated, duodenal ulcer were selected for the study. Prior to x-ray therapy all patients were placed on the usual hourly milk-cream and antacid regimen. At 9:00 p.m. nightly the stomach was completely emptied and a Levine tube was introduced through the nose, through which continuous Wangensteen suction was maintained for the ensuing 12 hours. Usually sleep was not disturbed. No antispasmodics or secretory depressants, such as atropine, were given. Three continuous nightly aspirations were obtained before x-ray treatment was started, and the free acidity was determined by the usual methods. Nocturnal secretion was studied in 9 patients during x-ray therapy and in 15 patients from 14 to 150 days after the completion of therapy.

Treatment consisted of the daily application of 1,350 to 1,750 roentgens to the body and fundus of the stomach through two portals located anteriorly and posteriorly and was carried out for a period of 10 to 14 days.

The fasting nocturnal gastric secretion of all patients was found to vary from 550 c.c. to 1,750 c.c. the average being 1,110 c.c. with a free acidity ranging from 18 to 122 clinical units the average being 63. These findings are quite comparable to those of Dragstedt who studied the nightly gastric secretion by a similar method.

Of the 9 patients studied during the first week of ray therapy 7 showed a decrease and 2 an increase in the volume and free acidity of the night secretion. Of the 15 patients studied at varying intervals after therapy, 14 showed an average decrease of 47.4 per cent in volume. In 1 patient the total nightly volume was increased over that prior to therapy but the free acidity had disappeared. X-ray studies of this patient showed a considerable amount of obstruction which might have caused the increased volume. All patients showed a marked reduction of free acidity in the nightly secretion

which, in 13 of the 15 amounted to complete achlorhydria. The duration of the depression of gastric secretory activity as manifested by measurements of the fasting volume and the gastric response to histamine is not intended as a part of the present study yet it is shown to be of regular occurrence for varying periods up to 5 months at the minimum.

Walter Cameron, M.D.

Brun, G., and Landellius, E.: Radical Resection for Chronic Ulcer (La résection radicale dans la maladie ulcéreuse chronique) *J. internat. chir. Bruxelles*, 1947 7 1.

The authors review 1,070 cases of patients operated upon for peptic ulcer with a primary mortality of 3.5 per cent.

The sex incidence was in a ratio of 4 males to 1 female. Sixty per cent of the patients were between 30 and 40 years of age. Two-thirds of the patients had an ulcer history of 5 or more years duration, and in one-third of the patients symptoms had been present for more than 10 years. Sixty per cent of the patients had symptoms between the ages of 20 and 40 years, and 9 per cent before the age of 20 years. In recent years fewer gastric and more duodenal ulcers have been found. In three-fourths of the cases the ulcer was duodenal or juxta-pyloric in location. The majority of the ulcers were within from 0.5 to 1.0 cm. of the pylorus. Malignant degeneration was found in 1.6 per cent of the entire group and in 5 per cent of the gastric lesions.

The authors prefer a gastric resection of the Billroth II type with a retrocolic Polya-Reichel anastomosis, and this was done in 758 of the cases. The preoperative management is reviewed and the operative technique described in great detail. The post-operative care is also discussed.

A review of 459 cases observed for more than 5 years after operation by clinical and x-ray study showed good results and no recurrence in 97 per cent. The majority of the patients in this group had been operated upon because of recurrent symptoms and unsatisfactory progress on medical management.

The authors conclude that radical resection at an early stage in a young individual relieves the patient of subjective complaints, removes the risk of operation in an advanced stage, and eliminates the necessity for long continued dietary management.

Edward W. Gross, M.D.

Marshall, Samuel F. and Welch, Mark L.: Cardnomas of the Stomach. The Rat of Operability *Surg. Clin. N. America*, 1947 37: 63.

Between 1936 and 1945 in the Lahey Clinic 653 patients were operated on for carcinoma of the stomach. Resection was possible in only 169 patients, or 41 per cent of this group. Operability however was even much less (24.1 per cent) when one considers the number of resections possible in the cases in which the diagnosis of cancer was incontrovertibly established by various diagnostic methods. Of a group of 469 patients with a preoperative diagnosis

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of carcinoma only 113 had resection of their neoplasms.

The resection rate has declined slightly over this 10 year period. This is distinct evidence that no improvement in earlier diagnosis has been made. If an increase in the operability and the postoperative survival rate is to occur, earlier diagnosis of this type of malignancy must be made. This can probably best be done by means of x ray studies of all patients in whom gastric symptoms are present, regardless of age. Clinical interpretation of any type of gastric distress should not be condoned until adequate study has been made to rule out gastric malignancy. Only then is the physician justified in medical treatment of so-called indigestion. SAMUEL KAHN, M.D.

Marshall Samuel F. and Brown Lowell H.: Total Gastrectomy. *Surg. Clin. N. America*, 1947, 27, 611.

Total gastrectomy is a radical operative procedure designed to remove the entire stomach in most instances for extensive malignancy arising in that organ. In the main there is only one definite indication for total gastrectomy—the presence of a tumor which so involves the stomach that it cannot be removed by partial gastrectomy. Total gastrectomy is to be avoided if all demonstrable tumor evidence can be removed at the time of operation. Also evidence of widespread or distant metastases precludes the employment of this operation. Should there be involvement of the adjacent organs, the operation is advisable only if the involved areas can be included in radical extirpation of the malignant lesion and this is seldom possible. Portions of the spleen should be removed in this majority of these cases. This does not include the mortality rate and simplifies the complete mobilization of the stomach.

Total gastrectomy is indicated in tumors of the cardia and fundus, or in widespread malignant disease confined to the stomach such as linitis plastica.

When x ray studies indicate extensive involvement of the stomach which is involved. Usually gastrectomy must be considered if it is important to determine whether the esophagus will be found free of encroachment on the esophagus is evidence of obstruction or obstruction of the esophagus indirectly. Should the x rays and esophagoscopy indicate involvement of the esophagus, transhiatal resection of the cardia, or even total gastrectomy should be done by this route.

In all of the group of 95 cases reported resection was done by the transabdominal route. This operation carries less operative risk and a more thorough removal of the lymphatic glands can be done through the abdomen. Continuous spinal anesthesia has been used in all cases and maintained for long periods with perfect relaxation and without shock. It can be supplemented by curare or sodium pentothal if greater relaxation is needed during the procedure. There were 27 postoperative deaths in this series of 95 cases. Fifteen deaths resulted from contamination

and infection. Eight deaths followed serious chest complications. Although some of these complications could possibly have been avoided in the earlier cases by the use of chemotherapeutic agents, it is important to emphasize that clean surgery, lack of trauma, and absence of contamination are the most important factors in preventing the complications. Cardiovascular complications caused 4 deaths. The operative mortality in 46 cases, during the period from 1927 to 1942 was 41.3 per cent. In 49 cases operated on since 1942 the operative mortality was 16.3 per cent. SAMUEL KAHN, M.D.

Gretter, Stent: A Contribution to the Knowledge of Primary True Concretions in the Small Bowel. *Acta chir. scand.*, 1947, 95, 387.

The author has observed one case of true concrement of the small bowel. Ten similar cases have been reported previously in the literature and are discussed in detail. The essential cause in the formation of enteroliths must be of a mechanical physical nature as the chemical conditions are practically always identical. Diverticula and bowel strictures play an important role in the creation of true bowel stones. The retention of developing enteroliths and the stagnation of chyme favor the deposition of concretions forming substances. Enteroliths of different chemical nature have been formed by the same process, the composition of the surrounding, being the chemical nature of the surrounding, mineral salts such as is found in the upper ileum where there is an alkaline reaction. Calcium oxalate and zinc sulphide can precipitate either in an acid or alkaline medium.

True small bowel stones are of two types (1) a solitary rounded larger stone obstructing a small bowel which has no other hindrance for passage, formed more likely, in diverticula, and at times if large enough causing symptoms when delivered into the free lumen of the bowel (most choleic acid stones have been of this type) or (2) one or more often small concretions found just above an incomplete constriction. Stones of mineral salts no doubt have been formed in front of the obstruction the bowel immediately in front of the obstruction. Enteroliths of other chemical composition can also have developed in diverticula higher up in the bowel and been stopped after having invaded the free gut in front of the stricture.

RICHARD J. BERNETT JR., M.D.
Acta chir. scand.

8. Krook, S.: Obstruction of the Small Intestine Due to Adhesions and Bands. *Acta chir. scand.*, 1947, 95, Supp. 125.

The author deals with the problems of abdominal adhesions and intestinal obstruction in a most exhaustive manner. The first portion of this study is devoted to an extensive analysis of the literature pertaining to peritoneal adhesions, their etiology

pathogenesis, and research concerning their prevention. The statistical material comprises 477 cases of intestinal obstruction due to adhesions, taken from the records of 5 hospitals over a 30 year period.

From a review of the literature on the prevention of adhesions, the inevitable conclusion is reached that the only reliable means we have to date for the prevention of adhesions is to spare the peritoneum from infections and mechanical traumas. Attempts to prevent adhesions with so-called lubricants often have the opposite effect, and the results from experiments have been negative or doubtful. The intra-peritoneal use of heparin for this purpose is too dangerous for widespread application and is still of doubtful value.

A review of the literature indicates that the high mortality of intestinal obstruction at the beginning of the twentieth century has been lowered until it is now below 50 per cent. The duration of symptoms has a vital bearing on the result of the treatment, which, in itself, depends on many factors such as the age of the patient and whether or not there is strangulation. The mortality associated with every operation other than simple reduction of adhesions is high and is more dependent on the patient's condition than on the nature of the intervention. About 30 per cent of all cases of intestinal obstruction are complicated by strangulation. Despite many articles pointing out the diagnostic features of strangulation, it is nonetheless very difficult in many cases to distinguish strangulation obstruction from simple obstruction at a sufficiently early stage.

As a control group the author analyzed 417 cases of peritonitis following appendicitis and 183 cases of peritonitis following gynecological operations. In the appendicitis-peritonitis group 4 per cent had late obstruction, 7 per cent had considerable distress, and 89 per cent had no late symptoms. Of the gynecological cases, the frequency of obstruction was less than 1 per cent. The distress frequency was greatest in the fertile ages. Using these groups as a basis for comparison a total group of 477 patients with proved intestinal obstruction due to adhesions is analyzed. The mortality from the first operation for obstruction was approximately 50 per cent. In fully one-half of all cases a satisfactory result was obtained by operation. Among the survivors who were followed up 14 per cent had a recurrence, 8 per cent still had considerable distress, and 68 per cent showed satisfactory results. Two per cent of those patients surviving a first operation for intestinal obstruction died of obstruction at some later date.

Males fall victim to obstruction more often than females, even when all the gynecological material is included for comparison. Males also have a higher mortality rate. Of the surgical operations preceding the operation for obstruction those on the appendix have been the most frequent, gynecological laparotomies take second place, and hernial operations third. Mesenteric lymphadenitis gives rise to obstructive adhesions, but it is difficult to gauge the frequency of this etiology. The frequency of re-

currence of obstruction varies greatly with the etiology, and it is probable that the nature and severity of the original morbid process preceding the obstruction, whether this process has led to laparotomy or not, has a great bearing on the frequency of obstruction.

Cases of early obstruction have a higher mortality than the later groups. Interestingly enough, the diffuseness of the adhesions at the time of operation has little effect on the frequency of recurrence. Possibly the risk of recurrence diminishes when very diffuse adhesions are present, rather than individual bands. Voluntary or involuntary opening of the intestine during operation for obstruction probably has no considerable effect on the recurrence risk, although opening of the bowel does increase the mortality somewhat. The intervals of time between laparotomy and obstruction as well as between obstruction and recurrence show a proportional ratio.

At the second operation for obstruction, the mortality was 9 per cent, compared with a 50 per cent mortality at the first operation. Although the recurrence rate after the second operation is not appreciably different from that following the first, the results after further repeated operations become less and less encouraging.

In cases of recurrence of obstruction from adhesions following one or two previous laparotomies, scrupulous search should be made at the operation for foci of intraperitoneal infection. Special attention should be directed to the adnexa, the appendix, mesenteric glands, and Meckel's diverticulum. In some cases a short-circuited loop may be found. A ray examination of the lungs is indicated in all cases in which the etiology is not demonstrated with certainty. This is necessary because of the frequency of adhesions following tuberculous peritonitis. In laparotomies it is most essential to achieve the best possible peritonealization and to avoid opening the intestine unnecessarily. Enterocanastomosis is considered a suitable measure by which to evade obstructions when they are caught in a conglomerate mass of small intestinal loops. Resection for the purpose of preventing the formation of new adhesions is of doubtful value.

Considering the view advanced in this study that chronic infection plays an important role in the recurrence of adhesions, it does not seem likely that any considerable effect is to be expected from so-called adhesion-preventing agents introduced into the peritoneal cavity. On the other hand it might be possible to reduce the frequency of adhesions by combating acute and chronic infections through chemotherapy and antibiotic therapy. Measures which reduce the morbidity of tuberculosis also act in this direction.

HAROLD LAUTMAN, M.D.

Groen, J: Psychogenesis and Psychotherapy of Ulcerative Colitis. *Psychosomat. M.* 1947 9: 151

In 1930 Murray first called attention to the peculiarity of character of and the occurrence of psychologic conflict in patients with ulcerative colitis.

patient dares or can confess his difficulties. This state of betwixt and humiliation which the patient cannot solve by words or actions, and which he continues to conceal, precedes the outbreak of ulcerative colitis usually by barely a few days.

Treatment consists of 3 parts, namely an emotional catharsis and simple encouragement of the patient. These patients were told not to be ashamed of their great need for love and attachment. Their narcissism was gratified by making themselves superior to their father or teacher by virtue of their more refined inner life. Their lack of outward success was consoled by pointing out that the inner value of one's personality is appreciated only by a limited category of people. Groen concurred with his patients in the difference of opinion they had with their surroundings. As a result of this superficial type of treatment the colitis cleared up but the patients remained neurotics.

ROBERT TURNER, M.D.

Finocchiaro, R.: Clinico-Operative Study of 56 Patients with Tumors of the Colon (Considerazioni clinico-operatorie su 56 casi di tumore del colon) *Ann. ital. chir.* 1947 24 48.

Of 56 cases of tumor of the colon 31 occurred in men and 25 in women. The regional distribution was as follows: cecum and ascending colon 22.6 per cent, transverse colon and flexures 20.7 per cent, descending colon 5.6 per cent and sigmoid 50.9 per cent. A radical operation was performed in 50 per cent of the cases, a palliative operation in 45 per cent and the remaining cases were inoperable. Of 56 patients who underwent a radical operation and could be followed up 19 or 33 per cent, were alive from 1 to 9 years after the intervention and were able to engage in the customary social activities.

The author stresses the necessity of a complete roentgenologic examination in every patient with symptoms of colitis because the typical symptoms of cancer may remain masked for a long time.

JOSEPH E. NARAY, M.D.

Lahey, Frank H.: Prognosis of Patients with Carcinoma of the Colon, Rectosigmoid, and Rectum. *Surg. Clin. N. America*, 1947 7 670.

The length of time that features such as alteration in bowel function, obstructive pain, change in caliber in the stools, and the presence of blood are associated with carcinoma of the colon and rectum, is employed to determine the prognosis.

Degrees of secondary anemia and apparent inoperability can be present in lesions of the right colon and still the patients may be found to be readily operable with 5 year nonrecurrence rates of gratifying percentages.

Annularity and canalization as shown by the roentgenogram in carcinomas of the colon and rectum are an indication of the lateness of the lesion.

The fact is stressed that cases of this type are of interest only in prophesying operability and should never lead one to be discouraged in exploring them because of the unpredictability of the rapidity of

growth and metastatic involvement which go so consistently with carcinoma of the colon and rectum.

CHARLES BARON, M.D.

Bacon, Harry E. and McGee, Lowrain E.: Rectal Cancer. *J. Am. M. Ass.*, 1947 34-534.

Vesical dysfunction subsequent to abdominoperineal proctosigmoidectomy for carcinoma of the rectum or sigmoid is not an incidental complication. It constitutes one of the major problems of management. Urinary retention occurs which if untreated or uncontrolled, results in dribbling of urinary over flow infection and urethritis.

The authors believe that urinary retention following abdominoperineal proctosigmoidectomy unquestionably is due to trauma of varying nature and degree or more often to severance of the sympathetic and parasympathetic nerve fibers. These fibers constitute the inferior hypogastric or pelvic plexus and innervate the internal vesical sphincter and the detrusor urinae muscle. On removal of the plexus as interruption of the efferent and afferent stimuli to and from the bladder occurs which causes the bladder to become a hapless reservoir. The detrusor urinae is unable to contract because of the loss of the parasympathetic innervation.

In 7 of 244 patients upon whom an abdominoperineal proctosigmoidectomy was performed vesical atony occurred and normal urination was impossible. Of these 7 persons 5 are now well and urinate naturally. In 1 case the operation is too recent to permit evaluation. The seventh patient became insane and committed suicide.

Maintenance of the bladder at complete rest until it has regained its ability to function normally preserves its musculature and prevents vesical atony. For this purpose an indwelling urethral catheter is preferred to cystostomy. The authors have established a definite preoperative and postoperative routine management. Preoperatively the urine is cultured at the time cystoscopy and cystometry are done. Vesical hypotonia should suggest the presence of an infiltrating lesion at or in the immediate vicinity of the ampulla of the rectum—the site of the pelvic neural plexus. Immediately before operation a catheter is inserted into the bladder.

Postoperatively the bladder is irrigated with an antiseptic solution twice daily. Cultures of the urine are taken on the fourth and tenth postoperative days and at the latter time cystometry is also done. If the patient is capable of exerting voluntary pressure of 70 cm. on the tenth day the catheter is removed. The absence or presence of residual urine is determined by the reinsertion of a catheter immediately after voiding. If more than 60 c.c. of residual urine are present, the catheter is retained until the bladder is capable of more complete emptying. If the patient is unable to urinate after the removal of the catheter 200 mgm. of syntropan are administered orally 3 times daily to decrease the tone of the smooth muscle of the internal vesical sphincter. The administration of this medication

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is continued until normal urination occurs. Bacon and McCrea have not performed transurethral resection for this complication. Urinary retention may be transitory or may be present for days, weeks or months. If paralytic vesical atony develops the urinary retention may be permanent.

Impotence after proctosigmoidectomy occurred in 55.5 per cent of the cases in which the anal sphincter muscles were incised anteriorly whereas without division of these muscles the incidence of impotence was only 8.3 per cent. After the Miles type of abdominoperineal resection of the rectum the incidence of impotence is estimated at 95 per cent.

Positive urine cultures, while not always indicating the presence of cystitis nevertheless demand a constant alertness or guard against cystitis. It is believed that the preoperative administration of a sparsely soluble sulfonamides as a part of the routine preparation of the colon for major surgery exerts a bacteriostatic effect on organisms found in the urinary system.

D Allaines, F and Devimeux, P: Access to Rectum by Exclusive Sacral Route. Technique and Indications (L'abord du rectum par la voie sacrée pure. Technique et indications) *J. chir. Par.* 1947 63: 181.

The region of the rectal ampulla between the levator muscles and the peritoneal cul-de-sac can be reached through the sacral route without great damage to the mucosal muscular and nerve tissues vital for the normal function of the sphincters. This approach allows the isolation of the involved intestinal segment opening of the peritoneal cul-de-sac, ligation of the superior hemorrhoidal artery lowering of the sigmoid and re-establishment of the continuity of the gut. The procedure is surprisingly well tolerated and this factor represents the greatest advantage of the method.

Whenever the resistance of the patient is good, the authors advocate a combined abdominoperineal approach if a malignancy is present. On the other hand if only a limited resection is contemplated on account of benign papillomas or those in an early stage of degeneration the sacral route is recommended. This method is useful when only the surface of the papillomas shows signs of malignant degeneration or when the patient is more than 70 years of age and has a cancer of slow evolution and a low tendency toward involvement of the glands.

The sacral route is useful in the removal of tumors situated too high to be reached through the anus and too low for the abdominal approach.

The authors emphasize the fact that the rectal tumor which can be easily reached with the sacral approach, namely from 8 to 15 cm from the anus, is the site of at least 50 per cent of all rectal tumors.

For 8 days before the operation the patient is kept on a nonresidue diet and laxatives and enemas are administered daily. As a rule an iliac anus is established 15 days before the resection of a malignant tumor. A thorough abdominal exploration at the

time of the establishment of the artificial anus is strongly advised by the authors if a malignant lesion is present.

An excessive relaxation of the musculosponserotic planes caused by spinal anesthesia interferes with the proper anatomic repair and therefore the authors prefer general anesthesia with nitrous oxide. The patient is placed in a supine position. An inverted V incision is made in the sacrum is sectioned at a height which provides sufficient exposure of the lesion. Liberation of the rectum and extentionation of the rectosigmoid segment are done in the customary manner.

JOSEPH K. NAKAT, M.D.

LIVER, GALL BLADDER, PANCREAS, AND SPLEEN

Martin J. D., Jr.: Wounds of the Liver. *Ann. Surg.* 1947 125: 756.

Liver wounds, a major problem in abdominal wounds have an over-all mortality of 10 per cent. Trauma of the liver is classified as direct or indirect. The magnitude of injury in direct trauma from penetrating missiles is dependent on the explosive effect of the missile. From moderate to massive hemorrhage can occur without damage to the main hepatic vessels and ducts. Nonpenetrating wounds have a lower incidence but may present identical pathologic findings complications and outcome. Following cessation of hemorrhage there is still drainage from the biliary system. Repair must be effected by removal of devitalized and necrotic tissue and later regeneration. During tissue autolysis further vascular and biliary ducts may be opened.

Systemic effects are often out of proportion to the degree of injury. At first shock may be profound and not equivalent to the blood loss. Later secondary manifestations of injury appear. These are concerned with blood loss, biliary extravasation, hepatocellular damage and occasionally associated renal dysfunction and are manifested by anemias, bile peritonitis and empyema, jaundice, lowered blood protein, abnormal carbohydrate tolerance, and deficient fibrinogen and prothrombin formation.

The most serious complication that follows extensive atonal syndrome, more often of the syndrome has crushing trauma. The nature of the degree of functional not been satisfactorily determined.

It is desirable to ascertain the degree of functional impairment of the liver as this affords some index as to indicated treatment and the prognosis.

Experiments were done using dogs and control determinations of galactose tolerance, bromsulphalein excretion, alkaline phosphatase activity in serum and prothrombin time were made before and after anesthesia with intravenous pentobarbital sodium. The dogs were then anesthetized and their livers subjected to varying degrees of trauma and then they were allowed to recover for study. The author observed that the liver had a very large functional reserve, as well as tremendous recuperative and regenerative powers.

In discussing the treatment the author states that suturing of the liver can seldom be done except in wounds near the periphery and hemorrhage is controlled in most instances by packing. Whenever damaged tissues are placed in apposition the process of repair is delayed and necrosis and sloughing occur before union is complete. The use of muscle grafts and newer hemostatic agents in the control of bleeding is discussed. As yet there is no ideal material available for the control of bleeding from a traumatized liver.

In the repair of liver wounds it is essential to close all wounds of the diaphragm in order to restore the integrity of the cavities and prevent the passage of bile and blood into the pleural sac, and to restore the mechanics of the respiratory system.

Ideal treatment would consist of débridement but this cannot be done in most cases until a better substance for controlling liver bleeding is perfected. At present, drainage must always be carried out and these drains are preferably placed through a stab wound. The general care of the liver wound is of paramount importance.

W. FORSTER MONTGOMERY, M.D.

Shelnfeld, William: Cholecystectomy and Partial Hepatectomy for Carcinoma of the Gall Bladder with Local Liver Extension. *Surgery* 94:748.

A case of epidermoid carcinoma of the gall bladder with metastases localized to a resectable area of the liver is presented in detail. The feasibility and palliative value of liver resection for carcinoma of the gall bladder and local liver extension are discussed.

For comparison the results obtained with cholecystectomy for early carcinoma, or with simple exploration and biopsy for more advanced carcinoma are given.

From a survey of the cases collected liver resection when possible, appears to be of definite palliative value. However, the results in general are poor when compared with the results of radical surgery for carcinoma of other organs. JOHN J. MALONE, M.D.

Royer H., and Solari, A. V.: Cholangiography Performed with the Help of Peritoneoscopy. *Gastroenterology* 94:7556.

In 1935 it was suggested that the gall bladder be injected with radiopaque material through a needle passed through the anterior abdominal wall the operator guiding this needle with the help of peritoneoscopy. The procedure had been carried out safely and with it bile had been removed from the gall bladder for study. It was suggested that this technique be used in certain puzzling cases in which ordinary cholecystography does not give a satisfactory answer to the diagnostic question.

For the peritoneoscopy a tube only 4 mm. in diameter is used. Obviously it is important to enter the abdominal cavity at the right spot so that the gall bladder can be visualized well. The best site is one a little below the edge of the liver and from 3 to 5

fingers breadth from the middle line. The examination is started with the patient on the roentgenologic table.

After the gall bladder has been visualized, the special needle used for the injection is pushed through the abdominal wall, 2 or 3 cm. away from the peritoneoscope. This needle consists of two parts, one, a tube 7 cm. long and 1 mm. in diameter and the other an inner hollow needle 17 cm. long and 1 mm. in diameter. Its lower end is narrowed to make a hollow needle 15 mm. long and 0.5 mm. in diameter. First the larger needle is pushed through the abdominal wall and then the smaller one goes through that. Then from 20 to 40 c.c. of an aqueous solution of some radiopaque substance such as diodrast is injected into the gall bladder. The double needle is then withdrawn and roentgenograms are taken in the usual way before and after a fatty meal.

With this method the authors have been able to make anatomical, physiological, pathological, and medical studies of the gall bladder and the hepatic and common ducts.

Little that was new could be learned about the anatomy of the gall bladder and cystic duct, but a curious observation was made in regard to the terminal end of the common duct. It appeared to be sharpened or beveled on one side. This appearance in the roentgenograms of the common duct was confirmed by postoperative cholangiography.

Most of the gall bladders studied physiologically showed traction in the region of the neck near the cystic duct. The gall bladder tends to contract uniformly without any change of shape.

When the gall bladder empties, part of the bile tends to go up into the hepatic duct and into the liver. This suggests a dyskinesia or failure of the sphincter of Oddi to relax.

In some of the cases it was easy to demonstrate even gall stones.

A contraindication to the use of this technique is acute inflammation in the region of the liver. So far there has been no accident with this technique.

In the presence of a puzzling jaundice, this technique can make possible an exact diagnosis.

HARRY W. FINE, M.D.

Cattell, Richard B.: Anastomosis of the Duct of Wirsung; Its Use in Palliative Operations for Cancer of the Head of the Pancreas. *Surg. Clin. N. America*, 94:71636.

Obstruction of the duct of Wirsung is a common finding in cancer of the head of the pancreas. It leads to marked disturbance of nutrition and causes digestive and bowel complaints. The earliest symptoms associated with obstruction of the pancreatic ducts are the direct result of a diminished amount of external pancreatic secretion. A change in bowel function is often the first symptom. Much intestinal gas may be present, with watery stools and intermittent diarrhea. The stool may become foamy and of increased bulk. General abdominal discomfort and indigestion are frequent complaints. Back

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pain may be the only localizing symptom. When the malignancy is primary in the duct of Wirsung or in the head of the pancreas the process may extend considerably before it causes obstructive jaundice.

It is possible to differentiate carcinoma of the ampulla from carcinoma of the head of the pancreas by reviewing the order of the onset of symptoms. Carcinoma that begins in the head of the pancreas and usually cause obstruction of the common bile duct. Santorini before obstruction of the common bile duct. Thus, the symptoms of indigestion, gas, bloating, diarrhea, and bulky foamy stools will be initial symptoms. Carcinoma of the ampulla of Vater on the contrary causes early obstruction of the common bile duct so that pruritus and jaundice are the first symptoms and only later as the pancreatic ducts are involved are other symptoms produced.

A new method of anastomosis of the duct of Wirsung to the jejunum in cases of inoperable carcinoma of the head of the pancreas is presented. This may be done as an open anastomosis over a T tube, or as a closed anastomosis of the duct of Wirsung in the intestinal tract, and may be followed by temporary dramatic relief of the digestive symptoms and a satisfactory gain in weight.

A case is reported to illustrate what may be accomplished by this procedure. Anastomosis of the duct of Wirsung as well as anastomosis of the biliary tract to the jejunum should be done whenever feasible.

SAMUEL KANE, M.D.

MISCELLANEOUS

Dragstedt, Lester R. Clarke, James S. Harper, Paul V. Jr. Woodward, Edward R. Tovee, E. Bruce: Supradiaphragmatic Section of the Vagus Nerves to the Stomach in Gastrojejunal Ulcer. *J. Thorac. Surg.*, 1947, 16: 226

This article is a continuation of observations made by the authors previously

The theoretical basis for section of the vagus nerves in the treatment of peptic ulcer may be summarized as follows:

1. Current procedures in the management of peptic ulcer are designed to neutralize acid gastric juice or decrease its production.

2. When excessive continuous secretion of gastric juice is maintained in experimental animals peptic ulcers appear and progress.

3. An excessive continuous secretion of gastric juice occurs in most patients with peptic ulcer. This is most noticeable at night when ulcer bearing patients are found to secrete from 2 to 10 times as much acid as the nonulcer bearing patients.

4. Section of the vagus nerves to the stomach reduces the secretion of gastric juice in normal animals and in patients with peptic ulcer to an even greater degree. The psychic phase of gastric secretion is abolished by vagus section. Humoral and other factors influencing gastric secretion are present but the extent of their activity is not certain.

The night secretion in 105 vagotomized ulcer patients was reduced to one-seventh of the preoperative average.

The relief following vagotomy was so complete as to suggest that loss of pain sensation was produced, but introduction of 0.5 per cent hydrochloric acid into the stomach of vagotomized ulcer patients produced prompt recurrence of the preoperative pain.

The symptoms are relieved by vagotomy and the ulcers heal as measured by clinical standards as well as roentgen study.

In obstructive lesions complicating ulcer correct interpretation of postvagotomy complaints is important because the factor of obstruction may persist even though the ulcer heals. Ten gastrojejunal ulcers following gastroenterostomy or partial gastrectomy have healed under vagus section. Brief case reports of gastroduodenal ulcers and illustrative roentgenograms are appended.

HERMAN T. LAMGTON, M.D.

GYNECOLOGY

UTERUS

Given, William P.: Carcinoma of the Cervix. *Am J Obst.*, 1947 53 947

The author reports a statistical analysis of 212 patients with cancer of the cervix uteri treated in the clinic of the Cornell University Medical College, Ithaca, and the New York Hospital, New York, New York, from 1933 through 1944. Of the total of 212 cases, 65 per cent were classed as stage 1 or stage 2 and 35 per cent were classed as stage 3 or stage 4 (League of Nations classification). Of the 212 patients seen from 1933 through 1940, 49, or 23 per cent, survived for 5 years or more.

There was no correlation between the histological classification of the cancer and the survival rate. Of far greater importance is the clinical classification in that those in stage 1 stand a good chance for survival while those in stage 4 are hopeless. Age and parity do not seem to affect the survival rate. Over 50 per cent of the patients were in the groups of stage 1 and stage 2 and had symptoms for 3 months or less. Ten per cent had no symptoms referable to the cancer when it was discovered. The author attributes this to careful inspection of the cervix and the routine biopsy of all cervical lesions including those not obviously malignant.

There were 12 cases of cancer of the cervical stump (5.7 per cent). The author believes that this high incidence lends argument to the use of total hysterectomy rather than the subtotal operation.

The patients were treated first by roentgen rays and then by radium. Roentgen therapy alone was used in a few of the advanced cases. Surgery was performed in only 6 cases.

The 4, 3, 2, and 1 year survival rates for the 97 patients seen from 1941 through 1944 are not appreciably different from the rates over the first period (1933 through 1940) despite the fact that in 1940 the radiation techniques were altered. There were 47 cases of late reactions to irradiation in the total group an incidence of 22.1 per cent. There were about twice as many reactions in the patients who were treated before 1940 as in those who were treated after 1940. This reduction in complications is attributed to improved technique in radiation therapy.

JOHN R. WOLFF, M.D.

Munnell, Equinn William: Total Hysterectomy. *Am J Obst.*, 1947 54 3

Should total hysterectomy be the routine procedure in the removal of the uterus for benign disease? To answer this question the author has surveyed 1,708 hysterectomies performed on the gynecologic service of the Bellevue hospital, New York, New York. Of this number 1,583 were subtotal and 215 were total hysterectomies.

The outstanding argument in favor of removal of the cervix at the time of hysterectomy has been that

It removes the possibility of subsequent development of carcinoma of the cervical stump. Less important arguments are the removal of the cervix as a possible cause of leucorrhea or focus of infection. The chief argument against the routine use of the total procedure for benign disease has been the higher mortality and morbidity associated with total hysterectomy.

The operative mortality among the patients having total hysterectomy was 1.38 per cent (5 cases) as compared to a mortality of 1.76 per cent for the group in whom a subtotal hysterectomy had been performed. The author is of the opinion that the deaths in the former were not due to the fact that a total rather than a subtotal operation was performed, but to complications that occur with either operation. Pulmonary embolus (in 3 cases), cerebral thrombosis, and paralytic ileus with shock were the causes of the 5 deaths.

There is a slight increase in morbidity with the total operation and patients will run a slightly higher temperature for a longer period of time also, catheterization is required less frequently. Distention is about the same. The chance of injury to the bladder or the ureters, or both, is increased by the total procedure, although the author believes that this danger can be avoided by the proper technique.

Sexual response in women is not significantly different with the cervical stump remaining than with the cervix removed. The cervix, uterus, and ovaries seem to have little to do with libido and sexual satisfaction. In cases in which there are changes following hysterectomy the cause is undoubtedly psychogenic.

Since the only valid argument against the routine use of the total hysterectomy is the slightly higher mortality rate associated with it, the author believes that this is not tenable when the number of deaths from the possibility of cancer developing in the cervical stump are considered. The prevention of cancer of the cervical stump is an adequate reason for performing total hysterectomy in benign cases as long as the operation does not introduce an element of extra danger to the patient. Any teaching service should consider it its duty to turn out gynecologic residents skilled in performing a total hysterectomy.

JOHN R. WOLFF, M.D.

ADnexAL AND PERIUTERINE CONDITIONS

Kjellström, R.: Brenner Tumors of the Ovary (Ueber die Brennerschen Ovarialtumoren.) *Acta obst. gynecol.*, 1947 7 33.

A study of material collected at the gynecologic clinic of Allmänna Barnbördshuset, in Stockholm over a 14 year period from 1931 to 1944 revealed only 1 case of Brenner tumor of the ovary. The tumor had arisen in a 48 year old woman 18 years after the resection of both ovaries. At laparotomy a solid

SURGERY OF THE HEAD AND NECK

the operation. In all classes one usually operates on the poorer ear so that if no improvement takes place the poorer ear does not further handicap the patient.

In favorable cases poor results seem to be from two main causes: (1) closure of the new window by formation of new bone or by development of fibrous tissue or both; (2) secondary postoperative serous labyrinthitis—a reaction which takes place to some extent in every case in which the membranous labyrinth is exposed. In a general way the younger patients seem to be much more prone to have the window close by bone regeneration than patients in the older brackets. This can be readily understood when one considers that the processes of bone repair are much more active in the young. Closure of the new window can be caused by formation of new bone or by the development of fibrous tissue or by both and it is often not possible, from a clinical standpoint to determine accurately whether the closure is due to one or to the other condition.

There have been no cases in which permanent facial paralysis resulted, but there have been 2 cases in which transient facial paralysis was produced. There was a single case in which postoperative perichondritis was observed.

There have been no cases in which vertigo was persistent. The postoperative disturbance of equilibrium has usually disappeared promptly but one patient had some disturbance for about 2 months.

In spite of most careful operative technique and postoperative care there have been occasional cases in which the discharge from the ear persisted for 30 days.

Of the 123 consecutive patients operated on 30 failed to recover satisfactory hearing for any of the three tones (512, 1024, 2048) and in these the results should be regarded as failures.

In spite of the fact that 29 per cent of the patients in the series failed to recover any hearing only 5 had the hearing diminished below the preoperative threshold.

JOHN F. DUFFY, M.D.

Lindsay J. R.: Effect of Obliteration of the Endolymphatic Sac and Duct in the Monkey. *Arch. Otolaryng. Chic.*, 1947 45: 1

The discovery by Hallpike and Cairns that the clinical syndrome known as Ménière's disease is based on anatomicopathological changes in the inner ear, the most striking of which is dilatation or hydrops of the endolymphatic system, has directed attention to the physiology of the secretion and the maintenance of endolymph.

Various hypotheses have been proposed to explain the hydrops. On the basis of the histological appearance Hallpike and Cairns have postulated an interference with resorption of endolymph due to decreased vascularity of the perisaccular connective tissue. The histological study in other cases has not been consistently abnormal.

Seven experiments were performed on monkeys to determine the various degrees of destruction of the sac and duct. After operation the animals were observed for gross disturbance of equilibrium and the

ears were sectioned for histological examination at varying periods up to 3½ months. The endaural approach was used in all 7 ears, and the technique is described in detail.

The author's comments and conclusions are as follows:

In 3 ears not more than exposure and possibly simple drainage had been accomplished. In one ear the sac and major portion of the medial dilatation (sinus II) were destroyed. In one there was complete destruction of the sac and sinus II plus accidental opening of the posterior semicircular canal. In 2 ears the sac and sinus II were completely destroyed without operative injury of other labyrinthine structures.

None of the animals was observed to have any gross disturbance of equilibrium on the day following operation or afterward. No nystagmus was observed after the animals were completely out from under the anesthetic.

Pressure exerted in the cavities over a temporary pack at operation in some of the ears produced no conspicuous deviation of the eyes such as occurs routinely when a fenestra is made in a semicircular canal with out injuring the middle ear the mastoid process, or the labyrinth. Osteogenesis had progressed to varying degrees in the callus filling the operative defect. The membranous structures were well preserved. In all the ears the cochlear duct, the sacculus, the utricle and the membranous canals showed no abnormality of contour that could not be explained as postmortem artefact with the exception of one ear in which the posterior canal was injured at operation.

The sensory apparatus and neural elements appeared normal in all except the single ear in which the otolithic membrane was elevated from the saccular macula. The stria vascularis appeared normal in all ears as did also the cells of Hensen and Claudius.

These experiments demonstrate that in the monkey's ear the maintenance of a normal quantity of endolymph is not dependent on the existence of endolymphatic sac or the more differentiated medial dilated portion of the duct. While the histological structure of this part of the duct, consisting of cuboidal epithelium, rugose walls and surrounding vascular connective tissue, has suggested a probable function in the removal of endolymph it now appears that this structure is not essential for the performance of this function.

While the proximal dilatation at the junction of the utricular and saccular ducts (sinus I) along with a portion of the narrow part leading from it were not destroyed in these experiments, the lining in the proximal dilatation consists of an extension of the single layer of flattened cells lining the saccular and utricular ducts and assumes a cuboidal character only as the duct enters sinus II. The vascularity of the surrounding connective tissue becomes a feature only in the region of sinus II. It appears unlikely therefore, that the portion of the duct which was not destroyed possesses any specialized function in the control of endolymph.

stone hard, a adherent tumor twice the size of a man's fist, was removed from the left parametrium. Grossly, the tumor was golden gray and on section showed a few pea to bean sized cavities beneath the capsule. Microscopically large epithelial masses were found lying in a supporting framework of well developed connective tissue. The epithelial cells were polygonal in shape with well defined nuclei and a large amount of protoplasm. The boundaries between individual cells were quite distinct. Most of the epithelial masses were solid but a few central cavities filled with homogeneous material were observed.

According to R. Meyer there are two types of Brenner tumor—solid tumors with or without cyst formation and tumors which lie in the walls of cysts. The present case belongs to the first group. The question of the frequency or rarity of Brenner tumors cannot be answered at the present time since they are of slow growth and may cause no clinical symptoms for a long time. Their occurrence can be determined only by systematic study of ovarian specimens. They may occur in young women and are not definitely bound to any hormonal or circulatory characteristic of a particular age group but they are more common in older women. The solid tumors vary in size from that of a sage grain to that of a man's head, are sharply demarcated from their surroundings by their color and because of their similar appearance, are easily confused with fibromas. Definite proof of recurrence or metastasis after removal has not been established. Of significance is the reported occurrence of new growths of various types in the second ovary. A hormonal influence on the endometrium and on the sexual function by Brenner tumors has not been proved although post climacteric and irregular bleeding has been reported by some authors.

There are several theories concerning the origin of the Brenner tumor. According to R. Meyer it arises from the Walthard cell focuses. Kleins is of the opinion that it originates from the epoophoron. Schiller and Fanvet take the view that the tumor arises from the rete ovarii. These theories are not contradictory since the Walthard cell focuses, the epoophoron and the rete ovarii are of primary mesodermal origin. The presence of indifferent epithelium, mucous epithelium, serous epithelium and the plaster type of epithelium in the Brenner tumor can be explained by any of the three conceptions.

JOHN L. LINQUIST M D

Kleitsman R.; Horn Formation in Ovarian Carcinoma (Ueber Hornbildung in den Ovarialkarzinomen.) *Acta obst gyna scand* 1947 27 46.

Although ovarian carcinoma appears in manifold histologic forms with extreme variability in cell structure, flattened epithelium is rarely encountered microscopically. The case herewith reported is considered to be the eighteenth case in the literature. Up to the present time only 3 previous cases with flattened epithelium and horn formation in ovarian carcinoma have been reported with certainty and

because of the rarity of this condition the author reports the fourth case.

The patient was a 60 year old widow who had atopped menstruating 10 years previously and had had no subsequent genital bleeding. An abdominal tumor mass was palpated during a routine physical examination in connection with examination for heart trouble. There was no abdominal complaint and no edema of the lower extremities. At operation a partly solid and partly cystic tumor originating in the left ovary was found and removed. The cystic portion of the tumor contained about 1000 c.c. of fluid and its wall showed numerous papillary proliferations. The solid portion of the tumor was twice the size of a hen's egg and consisted in part of small pseudomucinous cysts and partly of solid tumor mass. Microscopic sections showed cylindrical cell carcinoma with glandlike formations, one to several cell layers in thickness and a sparse stroma. Here and there in the adenocarcinomatous portions were islands of flattened epithelium with pearl formation in a few places.

The diagnosis of this rare type of tumor depends upon microscopic study since any symptoms produced are of a general kind. Although in the present case no metastases could be demonstrated metastases have been observed in previously reported cases. The question of the histogenesis of flattened epithelium and horn formation in an ovarian tumor can be explained in several ways. The simplest explanation metastasis could not be established in the present case. The possibility of horn formation in a teratoma also suggests itself but in this case there was no evidence of teratogenous origin. The remaining explanation is horn development through metaplasia from an indifferent matrix. This explanation does not entirely answer the question but raises another question, namely that of the origin of these indifferent cells and their capacity to differentiate into flattened epithelium. It is assumed that a derivative of celomic epithelium provides the undifferentiated matrix. Histogenetically this tumor, like the Brenner tumor is supposed to arise from indifferent cells of mesodermal origin with special properties of differentiation.

JOHN L. LINQUIST M D

MISCELLANEOUS

Bartlett, Marshall K.; The Surgical Treatment of Urinary Incontinence. *England J M*, 1947 236 965

Up to the time the present study was undertaken at the Massachusetts General Hospital Boston the operative cure in patients with exertional or stress incontinence was about 50 per cent. The usual procedure was repair of the anterior vaginal wall and a figure-of-eight or mattress stitch placed at the bladder neck.

The author believes that stress incontinence results when function of the involuntary sphincter mechanism is impaired owing to stretching and distortion of the bladder neck and proximal urethra.

This occurs after trauma that allows these structures to sag away from their normal positions behind the pubic arch. It is emphasized that although the voluntary sphincter may be damaged in the process, such damage is of little, if any importance in the production of stress incontinence.

The success of an operation for stress incontinence is considered therefore, to depend on the restoration of the bladder neck and urethra to their normal anatomic positions thus allowing the involuntary sphincter to resume its normal function. Various operative procedures having this principle are discussed.

Sixty three operations performed on 63 patients are reported. All patients complained of exertional urinary incontinence resulting from childbirth trauma. In the first 43 cases the technique described by Kennedy was followed. The vaginal mucosa is elevated from the bladder neck and posterior two-thirds of the urethra, and the dissection carried laterally under the pubic ramus until the urethra is entirely freed of its lateral attachments including any post-traumatic scar tissue that may be present. The urethra is then plicated in the midline to restore the function of the voluntary sphincter. In the last 21 cases of the series, stripping of the lateral attachments of the urethra from the pubic ramus was discontinued. It had been found that such dissection resulted often in considerable hemorrhage which was difficult to control and it was noted that the loss of these lateral structures might interfere with the replacement of the bladder neck and urethra in the normal positions.

The operations were performed during the period between 1939 and 1942. Forty-four patients (70 per cent) were cured. Of these 12 patients were followed up for an average period of 14 months, and 32 for an average period of 17 months.

L. JAMES TALBOT, M.D.

Walker, Louis M. and Huffman, John W.: Adenocarcinoma of the Female Urethra. A Review. *O. Bull. Northwest Univ. M. School*, 1947 21: 1-5.

Twenty-seven cases of true adenocarcinoma of the female urethra and 5 cases of questionable adenocarcinoma of the female urethra were collected from the world's literature. Eleven cases in which the diagnosis of adenocarcinoma was uncertain were discussed in detail.

The origin of the tumor is thought to be in the paraurethral glands. The histologic picture is that of a glandular carcinoma reproducing the glandular arrangement of the source.

Analysis of the cases reveals that a "tumor" or nodule of the urethra, burning and frequency on urination and dysuria are the most common symptoms. A red mass at the urethral meatus is the most common finding of adenocarcinoma of the female urethra.

The final diagnosis depends on the histological findings in the excised tissues.

Prophylactically all urethral caruncles, adenomas, papillomas, and polyps should be removed and examined histologically. Most perurethral cysts should also be excised. Surgical excision was the treatment of choice of adenocarcinoma of the female urethra in earlier years. Most of the cases in the collected series were treated surgically. In 3 of the 17 some form of radiation followed excision. Irradiation was used in only 6 of the 23 cases in which treatment was discussed. It is, however, favored today because it usually preserves urinary continence and appears to be as effective as surgery in the treatment of this neoplasm. The interstitial application of radium to the lesion followed by bilateral dissection of the inguinal glands is also advocated.

CHARLES BARON, M.D.

OBSTETRICS

PREGNANCY AND ITS COMPLICATIONS

Penttinen, Karl: On the Wassermann and Kahn Reactions during Pregnancy. *Acta obst. gynec. scand.* 1947 27 Supp. 3

This monograph is basically planned to ascertain the influence of pregnancy on serological reactions for syphilis. It can be recommended on the basis of its excellent statistical data. The essay seems to be designed primarily for those interested in biologic reactions particularly in relation to syphilis.

The author's work is extremely thorough with the exception that considerable international literature has necessarily been omitted because of the war. A majority of the references are to the Scandinavian English and American literature.

The author was primarily interested in the age old statements that (1) pregnancy causes an increased incidence of positive serologic reactions for syphilis and (2) that pregnancy exerts a beneficial effect i.e. a tendency toward a cure for syphilis.

Following a review of the literature, the author presents all of the techniques of investigation plus his own results. His investigations centered upon eight major questions. The first question considered was: How many false positive results were obtained during pregnancy? He concluded that false positive serology was no more common in pregnant patients than in the nonpregnant controlled group. He further believes that the false positives which are noted in pregnant women as well as in the nonpregnancy controlled group are due to technical variations rather than some factor associated with the pregnancy.

An attempt to discover a common factor in the group of patients showing false positive results failed to yield any specific relationship. However, the incidence of syphilis and positive serology among the unmarried group was found to be higher than in the married group as one might expect.

The author was next interested in the serologic factors which were characteristic of the group with false positive results. The results indicated that certain diseases will give an indeterminate percentage of positive Wassermann reaction. These diseases are listed in most of the standard textbooks, and almost invariably give weak quantitative reactions. In general they consist of new growths, virus infections, and other spirochetal diseases.

In respect to the technical differences, he noted a difference in results of the various laboratories. The obvious conclusion was that the greatest single factor in any biologic test depends upon the laboratory technique. It is important, therefore to use multiple laboratories and techniques in reaching a diagnosis of syphilis. In this respect the author concluded from his data that the Kahn verification test was of value in the diagnosis of syphilis but not of absolute significance.

The effect of the duration of pregnancy on biologic tests showed no significant statistical variation so that the hormonal and physiologic changes apparently have little or no effect on the reaction.

The moral of the essay is that all biologic tests may yield false results. In the present study the range of error was considered to be one in a thousand. When diagnosis depends upon biologic tests other means of diagnosis should be included and the test should be repeated several times and in different laboratories.

JAMES F. DONNELLY, M.D.

Belvedere, C. and Morano, M.: Relation of the Arterial Retinal Pressure, Index of Frits, and Ocular Tone to the Modifications of the Fundus Oculi in Normal and Pathologic Pregnancy (*Pressione arteriosa retinica, indice di Frits e tono oculare in rapporto alle modificazioni del fundus nella gravidanza normale e patologica*). *Riv. ital. ginec.*, 1945 29 125.

This article is a continuation of a previous one in which the authors had concluded that a functional arterial spasm related to the arterial pressure occurs in the fundus of the eye during pregnancy. Continuation of the etiological factor leads to arterial spasm and vascular changes in other tissues which may become organic. These ocular phenomena, frequent in the primipara, are severe in the toxemias of pregnancy and very severe in eclampsia. The current opinion regarding these spastic changes in the eye is that they are an expression of a generalized involvement of the arterioles and precapillaries that takes place in all pregnancies which during the first half of a pregnancy may be due to hormonal changes and hypovagotonia, and during the second half to hyper sympatheticotonia. The added toxemia ocular in origin presents in the pathological pregnancy and intensifies the picture by acting directly on the arterioles and indirectly on the sympathetic system.

The correlation between the modification of the retinal vessels and the general arterial pressure has been noted by Mylius Klaffen, Wagener, Mussey and Mastera. The authors claim that to these two factors which are important in evaluating alterations in the tissues of the pregnant woman (both normal and pathological) a third must be added i.e., the arterial pressure of the retinal vessels (A. P. R.).

In their studies they have made use of the index of Frits. This represents the difference between the weight necessary to obtain the first arterial pulsation, and the weight necessary to occlude completely the artery in diastole. It is measured in grams of water the normal being below 10 grams. It is important to evaluate the elasticity of the arterial walls, it being higher in all cases in which changes in the coats of the vessels are present.

The importance of tonoscopy and tonometry in normal and pathological pregnancy is emphasized by

the authors who advise the measurement of ocular tension. Ocular tension, a product of local pressure and pressure of the aqueous humor parallels the changes in the arterial pressure and enables one to measure the A. P. R. in millimeters of mercury in stead of grams of water.

The authors became interested in the relation of the index of Frits to normal and pathological pregnancy and undertook observations on 95 cases of pregnancy. The study included general examination, urinalysis, general arterial pressure, index of Frits, ocular tension and examination of the fundus of the eye. The Riva Rocci sphygmomanometer was used for the arterial pressure, the ophthalmotometer of Baillart for the arterial pressure of the retina of the eye and the tonometer of Schiötz. The authors believe that there is a relation between the vascular changes in the fundus oculi, the general arterial pressure, the arterial pressure of the retina, the index of Frits, and the ocular tension. They believe also that the toxemias of pregnancy provoke a generalized spasm of the vessels which is transitory and functional in the beginning but later becomes permanent and organic and leads to irreversible changes in various organs, especially those well supplied with blood. They explain the exceptional case with a normal fundus oculi and an increased A. P. R. by saying that either the arterial spasm affects the capillaries and cannot be observed with the ophthalmoscope or that the case may be one of those reported also by Baillart in which there is a normal fundus oculi of the eye and a normal blood pressure but a local elevation of pressure, no albuminuria and a normal azotemia. They disprove the statement of Baillart that the increase in A. P. R. may be due to endocranial hypertension by making lumbar punctures in cases of neuroretinitis and in 5 cases with choroidretinal separation, and reported that in these cases they did not find an increase in the endocranial pressure. A short functional spasm causes changes of no consequence in the affected vessels, but when the toxemias make this spasm permanent, sclerosis of the vessels, reduction in the size of the lumen, loss of elasticity of the walls and slowing of the blood stream occur. This increased resistance to the flow of blood brought about by the changes in the vessel walls, can be measured by the index of Frits, the normal being 10 grams with oscillations between 3 and 10 grams. This leads the authors to conclude that the index of Frits is of great importance in the determination of the elasticity of the vessels and is found to be normal in a normal pregnancy (a high normal found in only 4 cases) and greater than in the pathological pregnancy. This variation occurs *pari passu* with the severity of the changes in the fundus of the eye.

JOSEPH M. A. PAPP, M.D.

Robinson, David; Hardy, Paul; and Hellman, L. M.: The Effect of Diphtheria on Pregnancy with a Report of 5 Cases. *Am J Obst.*, 947 33 039.

The occurrence of diphtheria during pregnancy or the puerperium is rare. This is essentially true be-

cause diphtheria is primarily a disease of the first decade of life, and because the general practice of active immunization has resulted in a decreasing incidence of this disease during the present century. Recently however for reasons not yet clear there has been an increase in the incidence of adult diphtheria. Thus, during the past year 4 patients with antenatal diphtheria have been observed. These women with a fifth patient delivered in 1907, comprise the cases reported and represent the total number of patients with diphtheria seen in the Obstetrical Clinic at the Johns Hopkins Hospital Baltimore. In the past 50 years, during which time more than 50,000 deliveries occurred.

In the reviewed cases, pregnancy did not seem to alter the course of the disease in any way nor in the few cases reported by the author did the disease seem to alter the course or outcome of the pregnancy. All the mothers recovered from the disease and, following a normal labor, were spontaneously delivered of full term healthy infants free of the disease.

The treatment of diphtheria in the pregnant woman should be similar to that of diphtheria in the nonpregnant woman. Antitoxin is the most important single therapeutic agent. Secondary infections can be controlled by chemotherapy and antibiotics. Myocarditis, of course, should be treated by bed rest.

Although the reported rate of abortion in patients with diphtheria is 33 per cent, no interruption of pregnancy was observed in these cases, and none of them showed any premonitory signs of miscarriage. Abortion in acute infectious diseases with high fever however is not uncommon, and it is conceivable that inadequately treated diphtheria might result in a high rate of abortion.

No evidence was found that might indicate the passage of diphtheria toxin across the placental barrier.

JOHN R. WOLFE, M.D.

Bacon, Harry E. and Rows, Robert J.: Abdominoperineal Proctosigmoidectomy for Rectal Cancer Complicating Pregnancy; Report of 4 Cases. *South. M. J.* 947 40 472.

The literature on the subject of malignancy of the lower bowel complicating pregnancy was reviewed with a report of the authors' experience with 4 private patients.

The discussion involved a series of 23 cases in which operation was performed during pregnancy and 13 cases in which operation was instituted following abortion or delivery.

The symptoms in these cases are relatively the same as in any other malignancy of the lower bowel, but because they may be overshadowed by those of the pregnancy an added responsibility is placed upon the obstetrician. A careful history, digital examination, proctosigmoidoscopy, and opaque enema study are not contraindicated during pregnancy if warranted.

Pertinent to the management of this complication the following procedures may be recommended:

¹ In early pregnancy (3 months or less) abdominoperineal proctosigmoidectomy without colostomy and with preservation of the sphincter musculature or as a second choice, a Miles abdominoperineal excision especially when the lesion is less than 6 cm. from the anal margin with relative disregard to the pregnancy.

² In the second trimester when the fetus is not viable and the size of the uterus would necessarily interfere with removal of the growth Porro section and resection simultaneously if the condition of the patient warrants such a procedure.

³ In the last trimester of pregnancy cesarean section and hysterectomy followed by removal of the cancerous bowel from 2 to 4 weeks later.

When the circumstances are ideal and the condition of the patient excellent, radical resection performed at the time of section may be justifiable.

CHARLES HANCOCK M.D.

LABOR AND ITS COMPLICATIONS

Webster Augustus: *The Voorhees Bag*. 4m J Obst 1947 53 937

Since an increasing number of competent obstetricians have gone on record as condemning the use of the hydrostatic bag to a past era in obstetrics the author offers this survey of the use of the Voorhees bag in 164 cases among 28,000 deliveries from 1938 to 1944 inclusive at the Cook County Hospital in Chicago. The main indications for its use were to induce labor in toxemias and to control bleeding in placenta previa and premature separation of the placenta. It was used also in a miscellaneous group of cases consisting primarily of abnormal presentations and prolapse of the cord.

There were 163 infants (including 4 sets of twins) and the gross infant mortality was 85. Fifty-one of these babies were dead on admission of the mothers to the hospital. There were 34 stillbirths and neonatal deaths including 16 previsible babies. This gives a corrected mortality of 10.7 per cent.

A large percentage of the patients were not good risks for abdominal delivery. The author believes that it is not good obstetrical practice to subject a mother to the risk of abdominal surgery in the interim of a baby whose chances of survival are already minimal. It is better to deliver patients from below in all instances in which the viability of the infant is questionable.

It would seem that the use of the hydrostatic bag still has a limited place in obstetrics but no fixed policies can ever apply to its use. Careful consideration of each situation and good obstetric judgment are essential if the best interests of both mother and child are to be observed.

JOHN R. WOLFE M.D.

Fennoy J. K.: *Failed Forceps*. Irish J M Sc., 1947 No 257 190.

Reports of 70,000 deliveries in three Dublin hospitals were examined by the author. From these records information was obtained on 121 cases in

which forceps had failed. In 77 of these failures occurred outside the hospital and the patients were subsequently admitted in 44 cases failure occurred in the hospital.

Of the 77 patients outside the hospital who were subsequently admitted 38 were primigravidae and had had 2 to 6 pregnancies and 5 had had 7 or more. The maternal mortality was 16.9 per cent, and the fetal mortality 67.5 per cent. In the mothers who lived the complications were many the incidence of morbidity being 13 per cent. The author concludes from his analysis of these cases that the primary cause of the failure of forceps and of the subsequent complications was premature application of the forceps.

Of the 44 patients in whom failure of forceps occurred in the hospital 28 were primigravidae and 16 were multigravidae. The maternal mortality was 6.8 per cent, and the fetal mortality 43.2 per cent. The incidence of morbidity in the mothers who lived was 16 per cent. The author concludes from his analysis of these cases that the primary cause of failure of the forceps was a substitution of a trial and error approach for a careful clinical or x-ray examination, or both, and evaluation of the cephalopelvic relationship.

The conclusion reached is that a further effort should be made to reduce the incidence of failure of forceps. Better instruction of students and recently qualified men is believed to be the first logical step. A doctor should know not only when to apply for forceps but when not to do so. L. JAMES TALBOT M.D.

Pitkinen H.: *The Results of Treatment of Breech Births at the Midwifery School at Helsinki during the Years from 1934 to 1944* (Über die Behandlungsergebnisse bei Beckenendlagegeburten im Hebammeninstitut zu Helsinki in den Jahren 1934-1944). Acta obst. gyn. scand. 1946 27 Suppl 1.

The author collects and evaluates statistics from 813 breech deliveries made in a 10 year period and including children weighing 600 gm or more. The material includes 178 breech deliveries in 154 cases of twins. The over-all frequency of breech deliveries was 5.03 per cent and of single deliveries alone, 4.01 per cent.

In 653 single breech births 136 of the infants (20.8 per cent) died. However 74 of these weighed less than 2,000 gm. With the mothers divided into 3 groups—primiparas under 30 years of age, primiparas over 30 years of age, and multiparas—it was found that 43 (57.0 per cent) of the 74 deaths occurred in multiparas. Twenty-four (38.7 per cent) of the infants in the single breech deliveries weighing over 2,000 gm. were also in the multipara group. With over the reduced mortality amounted to 5.7 per cent, as a result of cesarean section although 3 maternal deaths followed this operation.

In the twin deliveries in which one or both fetuses were presenting and born in breech presentation the

total mortality was 35 (14.04 per cent) 14 of these infants, however, weighed less than 2,000 gm. The maternal mortality in the twin deliveries was 0 per cent.

The author believes that the prognosis for the child grows less favorable with cephalopelvic disproportion and in cases in which labor is long especially when the labor pains are weak. He suggests that by intensifying prenatal care one can forestall premature deliveries, especially in multiparas. Extraction of the fetus is an emergency operation. Cesarean section should be utilized (1) when obvious disparity between the pelvis and fetal head exists, (2) when one expects a big child although a contracted pelvis is not a certainty and (3) when labor pains are weak and the labor long.

WARREN R. LAMM, M.D.

Hunt, A. B., and DeVoe, R. W.: The Management of Delivery following Stillbirth from Previous Dystocia. *Am. J. Obs.*, 1947 53 81

The deliveries of 38 patients subsequent to stillbirth from dystocia in their primary pregnancies are reviewed. These patients were seen at the Mayo Clinic from January 1 1936 to July 1 1946. A gross fetal mortality rate of 1 fetal death in 36 deliveries, or 2.8 per cent was obtained. The infant in this case was dead in the uterus because of a severe toxemia of the mother on her admission to the hospital. There was no maternal mortality in this series.

When these data are added to those reported 10 years ago, it is found that 64 women had lost 71 babies from dystocia before this study was made. Subsequently they were delivered of 86 babies with 3 fetal deaths, a gross fetal mortality rate of 3.5 per cent. There was 1 maternal death early in the first series. The maternal mortality rate for subsequent deliveries was therefore slightly more than 1 per cent. Only 3 of the 64 women including the 1 that died are without normal living infants. One of these had a normal delivery but lost her infant some months later from nonobstetric causes. She is now pregnant and the chance for a living baby is excellent.

The opportunity for individual prenatal care, and examination and study of the safest method of delivery are most valuable in the care of these patients. In these cases the conduct of the first delivery subsequent to the stillbirth from dystocia seemed to determine the outcome in later deliveries. Patients who were delivered successfully through the pelvis continued to have this type of delivery and those who had to submit to abdominal delivery again required this management.

Carbonini, M.: The Prognosis in Cesarean Section in Pelvic Dystocia with Relation to Infection of the Genital Tract (La prognosi del taglio cesareo in rapporto al grado di purezza delle vie genitali nel caso di dystocia pelvica). *Ginecologia*, Tor 1947 33: 107

In a study of cesarean section between the years of 1935 and 1945 in which cases of pelvic dystocia, with or without genital infection, were compared as to

prognosis morbidity and mortality the author found the following factors influenced mortality: (1) the duration of labor (2) the time elapsed since rupture of the membranes, and (3) the febrile reaction during labor.

These cases were subdivided into 3 groups, namely clean contaminated and infected. The clean cases were those in which the cesarean section was done in the early stages of labor with intact membranes and in the absence of local pathological conditions such as vulval vaginitis or cervicitis with abnormal vaginal secretions. In this group the morbidity was 30.3 per cent, while the mortality rate was 0.69 per cent.

In the contaminated group were the cases in which the membranes had ruptured a few hours previously cases in which there had been repeated vaginal examinations, and cases with an elevated temperature, but not beyond 38°C. The morbidity rate was 50 per cent, while the mortality rate amounted to 2.38 per cent.

In the last group the infected cases, the temperature was above 38°C, and previous attempts to deliver the parturient through the vagina had been made. Putrefaction of the amniotic fluid was sometimes present with an increase in pulse frequency and leucocyte count, while the sedimentation rate exceeded 85 mm. This group carried the highest mortality and morbidity rate, having a 30 per cent mortality rate and a 80 per cent morbidity rate.

ARTURO F. CARLINI, M.D.

O'Connor, Cornelius T.: The Problem of the Repeat Cesarean Section—A Preliminary Study. *Am. J. Obs.*, 1947 53 914.

The mortality in repeat classical cesarean sections in this country is 3.5 per cent. This risk probably can be reduced to about 1.5 per cent. A review of similar experiences with the low cervical operation reveals a mortality of slightly over 1 per cent. In both procedures, second cesareans bulk large, with a much smaller number of third cesareans, and practically none beyond this. It is highly probable that the danger would have been greater were a larger number of fourth and fifth cesarean sections recorded.

The dangers of elective repeat section are both immediate (infection, ablation, atony, hemorrhage) and remote. The remote dangers of rupture of the uterine scar and intestinal adhesions are very marked after the classical section and exist to a much less degree after the low section. A conservative type of section with sterilization by various forms of tubal resection removes the dangers of rupture of the scar and risk inherent in another future cesarean section, but does not diminish the immediate mortality due to the procedure, nor the immediate and remote dangers from adhesions.

Evidence is presented that elective cesarean hysterectomy is simple to perform, causes less blood loss, has a smoother convalescence, and shows less morbidity than conservative repeat sections with or without tubal sterilization and in addition eliminates future dangers from a useless organ, the uterus.

This procedure should be given much more consideration as an elective procedure at repeat sections and should often be performed in the patient over 40 years of age in the presence of poor scars when the uterus does not contract perfectly, in the presence of marked adhesions, after the third or more classical section and in patients who are subject to severe grades of heart disease, kidney disease or tuberculosis. Further experience may reveal it to be the procedure of choice routinely at or after the third section even when it is of the low type.

JOHN R. WOLFE, M.D.

NEWBORN

Acken, Henry S. Jr.: Fetal Mortality in Cesarean Section. *Am J Obst* 1947 53 937

The author reports the results of a survey of the fetal deaths associated with cesarean section during the last 10 years at the Methodist Hospital, Brooklyn, New York. In 1938 he reported the results of a similar survey which showed a high fetal mortality (5.9 per cent). In his latest series of cases the maternal mortality was reduced from 3.18 per cent to 0.65 per cent while the fetal mortality remained about the same (4.9 per cent).

Prematurity is the greatest single cause of fetal mortality. It occurs most often in conjunction with placenta previa. The policy of delay in the active treatment of placenta previa might carry more in favor of infants closer to term but widespread advocacy of this policy would endanger the present low maternal mortality. In the event of maternal hemorrhage the mother should have early blood transfusion and pure oxygen should be administered to combat fetal anoxia. These procedures should be carried out even though there be no apparent need of them by the mother.

If cesarean section is indicated in patients with abnormal presentation operation should be performed early. Regional anesthesia prevents one cause of fetal anoxia and should be widely used in cesarean section. Spinal anesthesia produces greater relaxation thereby aiding delivery and lessening trauma to the baby.

In the present series of cases the fetal mortality associated with cesarean section was higher than that for vaginal delivery. The author pleads for an increase in the autopsies on stillbirths and neonatal deaths in the interest of accurate diagnosis.

JOHN R. WOLFE, M.D.

Rodriguez Velasco, Anibal: Vulvar Postpartum Chorioepithelioma (Corio-epithelioma vulvar primitivo post-partum). *Bol. Soc. chilena obst. gín.* 1946 11 312

Chorioepithelioma is without doubt the most malignant tumor of the genital tract. The author describes 2 cases: the first occurred in a woman who had passed the menopause and who had never been pregnant, while the second was of a vulvar ectopic postpartum type occurring in a 29 year old female who had had 3 pregnancies. The last terminated at full term with a normal delivery and no placental changes. One month post partum the patient had a severe vaginal hemorrhage from an eroded nodule beneath and to the left of the urinary meatus. Two months later she had a violent vaginal hemorrhage from an eroded zone in the left hemivulva, which looked like a black ulcerated tumor mass with multiple violet colored masses, some hard and others soft and easily enucleated. The Freedman test was strongly positive and the roentgenogram of the chest showed multiple metastases to the lungs. Biopsy of the vaginal lesion revealed a metastasis of a chorion epithelioma. The author attempted surgical removal of the tumor. Autopsy revealed metastasis to the brain, lungs, liver, spleen, and vagina.

The advantages of biopsies and biological titrations for diagnosis are stressed and the author favors extensive abdominal surgery even though metastases have spread. He advises deep x ray therapy for the metastases.

ARTHUR F. CITOLLA, M.D.

MISCELLANEOUS

Glirardi, V.: Influence of the Vitamin B Complex on Lactation (Influenza del complesso vitaminico B sulla secrezione lattica della donna). *Riv. ostet. gín.* 1946 1 146

Thirty-two women in the puerperium were divided into four groups and treated respectively with (1) total vitamin B complex, (2) vitamin B and nicotina mide, (3) vitamin B in massive doses and (4) vitamins B₁ and B₂. The subjects were given similar diets, and examination of the milk was done under standard conditions.

On the basis of the volume and the fat content, it was concluded that the administration of vitamin B complex, particularly B₁ and B₂, exercised a favorable effect upon lactation.

Chemical and physiological bases for these findings are discussed.

EDITH B. FARMWORTH, M.D.

GENITOURINARY SURGERY

ADRENAL, KIDNEY AND URETER

Abelhouse, Benjamin S.: Crossed Ectopia with Fusion. Review of the Literature and a Report of 4 Cases. *Am J Surg* 1947 73 638.

The distinguishing feature of crossed ectopia with fusion is the congenital transposition of one kidney to the opposite side with fusion of the other kidney to the other side. The author has collected 47 new cases of crossed ectopia with fusion and has added 4 personal cases which brings the total of reported cases to 337. This anomaly is encountered about once in every 7,500 autopsies.

There are 6 anatomical varieties of this anomaly which are presented in the order of relative frequency (1) unilateral fused kidney with the ectopic kidney in an inferior position (2) sigmoid kidney (3) "L" kidney (4) disc kidney (5) lump kidney, and (6) unilateral fused kidney with the ectopic kidney in a superior position. The anomaly has been found at various levels from the lower thoracic vertebrae to a position deep in the true pelvis. The age and sex of the patient with this anomaly apparently have little significance from an embryological or clinical standpoint. In the 337 cases reviewed the sex ratio was 4 males to 3 females. The majority of the cases occurred in individuals under the age of 50 years, particularly in the third, fourth, and fifth decades of life. There is no syndrome typical of this anomaly. The outstanding symptoms are pain and a palpable mass which are frequently accompanied by various urinary symptoms or abnormal urinary findings.

The diagnosis was made at autopsy in 120 cases, particularly in the early reports and in children dying of various diseases. An accurate clinical diagnosis was made by urographic methods in 134 cases and at operation in 37 cases. The most important diagnostic method is retrograde pyelography. Intravenous pyelography was employed in 15 cases and yielded positive information in 5 cases. Failure to make an accurate preoperative diagnosis may lead to dire results.

This anomaly is accompanied by various renal diseases, principally infection and dilatation of the pelvis. The crossed ectopic kidney is more susceptible to these pathological lesions than the noncrossed kidney. The surgical treatment may be conservative or radical and is governed by the nature of the pathological lesion, the extent of fusion deformity and the condition of the patient. In pregnancy dystocia is more likely to occur when the fusion anomaly is located at or below the promontory of the sacrum. Normal labor is to be expected when the anomaly lies above this level. Conservative or palliative surgery can be undertaken in this anomaly with as little risk as in cases with a normally formed kidney. Symphysectomy combined with nephropexy may be employed with good results in cases presenting no significant

pathological lesions but accompanied by pain of renal origin. Radical operation consists of removal of one renal component of the fusion anomaly, i.e., heminephrectomy. It is a safe surgical procedure which can be performed by the well trained genitourinary surgeon with great facility and minimal shock in the absence of unusual anatomical or pathological complications.

JOSEPH E. MAURER, M.D.

Bianchi, F.: Intrarenal Lipomas with the Description of a Case of Lipomyeloblastoma (Sul lipomi intrarenali con descrizione di un caso di lipomyeloblastoma) *Arch. Ital. med.* 1946 230.

Because of the rarity of lipomyeloblastoma and the difficulty of differentiating an intrarenal lipoma from a retroperitoneal neoplasm, this case is presented.

The patient was a female of 58 years. At 14 years of age she had a ptosis of both kidneys. Years later she experienced acute and continuous pain in the dorsolumbar region for which a body plaster cast was applied for a period of 8 months with no relief. From 10 to 15 months before the patient was seen by the author she had become aware of a tumor mass in the right lumbar region which gradually enlarged. A week before she entered the hospital she had experienced a sharp pain in the right lumbar area. No disturbance in urination was present but a brief painless hematuria had occurred many years ago. In the past few months she had lost 15 pounds in weight. The tumor was hard, irregular, tender on palpation, and slightly movable. It deformed the right lumbar region.

Microscopic analysis of the urine showed a few red blood cells and many uric acid crystals.

The azotemia was elevated to 0.66 per cent, however, after a diet on milk and vegetables it was lowered to 0.35 per cent.

The flat plate x-ray was negative, but pyelography revealed a large kidney with irregular calices and a ureter deviated toward the midline from pressure by the tumor.

A diagnosis of renal tumor on the right side was made, and the patient underwent surgery. The superior pole of the kidney was markedly enlarged and adherent to the peritoneum; also the adipose capsule was firmly attached to the renal capsule.

Gross examination of the specimen showed it to be of brown color and weighing 1,460 gm. with the enlargement mainly at the superior pole. Its dimensions were 33 by 2 by 3 cm., and on cross section about two-thirds of the mass was yellowish in appearance and lobulated. The consistency was soft and somewhat elastic, being not much dissimilar from normal adipose tissue.

Microscopic examination revealed fat cells with empty areoles similar to normal adipose tissue with the exception of the areoles of nonuniform dimen-

ations. Some cells were rich in cytoplasm with giant nuclei others presented nuclei of different form. The richness of the cytoplasm the size of the nuclei the presence of plurinucleate masses and especially the wide nucleated fibers made the author suspect myeloblastic tissue.

The patient recovered and was still well after 2 years.

ARTHUR F. CIPOLLA, M.D.

Davis, David M. : Ureteral Obstruction: Recent Advances in Its Embryology Nosology and Surgery. *Brit. J. Urol.*, 1947 19 71

It seems only a short time since conservative surgery for hydronephrosis was regarded by everyone with doubt and misgiving. The advance in this field has occurred gradually but unremittingly and now in retrospect the change in the whole picture is spectacular. It may now be asserted that operations for the cure of hydronephrosis are very reliable and that the results are as certainly predictable as in any other type of surgery. This fact necessitates drastic changes in the concept of the proper program of treatment in such cases. Nephrectomy in the future must be reserved for those cases in which the damage is extreme and irreparable.

This very gratifying situation has been brought about by the following factors: (1) increased knowledge of the underlying pathology (2) better methods of diagnosis particularly intravenous urography which can be employed by every medical practitioner (3) simpler operative methods (4) increased knowledge of the mechanical factors important in the postoperative period—namely, splinting kidney drainage and the prevention of sanding (5) the use of sulfonamides and penicillin to combat and prevent infection.

JOHN A. LOFF, M.D.

Figueron Alcorta L., Massolo O. and Molina Luis R. Spontaneous Rupture of the Ureter (*La ruptura espontánea del uréter*). *Rev. argent. Urol.* 1945 14 335

Spontaneous rupture of the ureter is a rare affection as the work of Surrao presents only 8 cases which were observed up to the year 1936. Nearly all cases are due to trauma, either external or internal and pyeloureteral lithiasis is the cause of the trauma in the majority of the cases. Although the papules in the calix are often the site for rupture the narrowings of the ureters are the most common sites and sometimes pyelographic manipulation is an etiological factor.

Two cases of spontaneous rupture are reported, both were due to lithiasis. The first patient had severe nephritic colic with an elevated temperature. Palpation revealed exquisite tenderness on the affected side with a tumor mass similar in character to an infected hydronephrosis or pyonephrosis. X-rays showed 3 small shadows within the renal zone, related to other calculi. An ascending pyelogram revealed the sodium iodide diffused in the perirenal tissues. A lumbarotomy was done which released a frank pyogenic greenish staphylococcal collection.

Two days later the patient passed a calculus the size of an olive seed. Subsequent X-rays revealed no remaining calculi. The patient recovered and was well 5 years after the initial onset of the condition.

The second patient had repeated attacks of renal colic dating back 15 years and also had passed gravel and a calculus. Fifteen days before entering the hospital he had renal colic with hematuria and high fever. However on admission the preceding symptoms had subsided. X-rays revealed a globular shadow with a line of phleboliths in the pelvis. A ureteral pyelogram of the right side with the use of a sound showed discrete dilatation of the ureter and a ureteral injection permitted diffusion of the contrast media to the perinephros. X-rays taken 3 days later showed complete elimination of the iodine. A few days later another ascending ureteral pyelogram with a Chevasse sound was taken and air was seen to escape into the perinephritic space. The last X-ray showed the ureteral fistula to be closed with no escape of iodine. In spite of all the manipulation the temperature did not rise and the patient was discharged 5 days after admission.

In both cases the process was revealed by pyelographic studies. In the infectious suppurative perireterorenal process the authors performed a lumbarotomy while in the second case the excellent condition of the patient led to expectant treatment.

ARTHUR F. CIPOLLA, M.D.

Burns, Edgar Kiltredge, W. E. and Hyman Jack: Bilateral Cutaneous Ureterostomy 18 Years After Ureterisigmoidostomy for Exstrophy of the Bladder. *Ann. Surg.*, 1947 125 788.

The present tendency in the treatment of exstrophy of the bladder is to perform ureterisigmoidostomy early preferably during the first 6 months of life before the bacteriological flora of the bowel become too varied and pathologic. The age at which the operation is performed does not of course eliminate such mechanical factors as angulation and stricture formation at the site of anastomosis factors which most likely account for the majority of complications encountered in these cases. The authors have reviewed the literature combining the reports of 13 authors and collecting 41 cases of ureterointestinal anastomosis in which the patients were alive from 6 to 44 years after operation. Thirty-eight per cent were reported as well while in the remaining 62 per cent the following conditions were encountered: hydronephrosis loss of function of one kidney renal calculi calculous pyonephrosis requiring nephrectomy and infected hydronephrosis requiring nephrostomy.

The authors suggest that the life expectancy of certain of these patients may be increased by ureterocutaneous anastomosis. They present the case of a 30 year old white male who had undergone bilateral ureterisigmoidostomy at the age of 12 years. Examination revealed bilateral hydronephrosis and unilateral renal calculus the patient had evidence of a renal infection which could not be controlled by

urinary antiseptics. Bilateral cutaneous ureterostomy was performed by the authors at the Ochsner Clinic, New Orleans, Louisiana and the patient made a remarkable recovery gaining in weight and health. The renal function was much improved.

The authors emphasize the following principles in cutaneous ureterostomy (1) freeing the ureter from its bed without stripping in order to avoid injury to its blood supply (2) allowing the ureter to project 4 or 5 cm. beyond the skin margin without angulation or tension, (3) closing the wound lightly around the stump without placing sutures in the ureteral wall and (4) using a loosely fitting catheter during the immediate postoperative period.

JOSEPH E. MAURER, M.D.

BLADDER, URETHRA, AND PENIS

Cifuentes, L.: Vaginal Epithelium in Female Trigonitis. *J. Urol.* Balt., 1947 57 1018.

The author describes a variation of the trigonal mucosa at its extremity near the vesical neck. These areas are variable in size, their color ranging from white to whitish gray. This abnormality is most often limited to the midline but may extend over the anterior two-thirds of the trigone. The posterior margin is always clear cut and irregular. The author believes that this occurs in over half of the adult women but that it is less common in elderly women however a precise statistical study is being undertaken to determine the incidence in various age groups.

In 30 instances biopsies were taken. The cellular morphology was different in these areas as compared to a normal bladder since the cells were larger, and the epithelial thickness greater. The epithelial picture simulates that of vaginal epithelium, with an appreciable glycogen content, epithelium not completely keratinized on the surface, well formed papillae, and often intraepithelial cornification.

The distinct difference between atypical areas of flat stratified epithelium and trigonitis is emphasized. Trigonitis is strictly an inflammatory process. The epithelial abnormality is asymptomatic without abnormal urine findings while trigonitis is symptomatic with a cellular picture in the urine of inflammation. The removal of septic foci (tonsillectomy) will often prove spectacular in the disappearance of a true exudative trigonitis. ROBERT LACK, JR., M.D.

Jewett, Hugh J.: Carcinoma of the Bladder. *J. Am. Med. Ass.* 947 34 496.

Pre-existing metastases pre-existing extravascular extension, intercurrent complications, and incomplete destruction or extirpation of the primary neoplasm are responsible for the current low survival rate in patients with infiltrating carcinoma of the urinary bladder. The existence of metastasis or extravascular extension of the growth means an advanced stage of the neoplasm which is incurable by any of the known methods of therapy. Low curability is generally caused by (1) late diagnosis (50 per cent of patients

have symptoms longer than one year while 30 per cent of patients have symptoms for from 2 weeks to 6 months) and (2) inefficiency of treatment which allows a tumor without extravascular spread to persist in the wall of the bladder until it has extended extravascularly or metastasized. It is hoped that late diagnosis will be avoided by education of the laity and members of the medical profession. Inefficiency of treatment will be recognized earlier and oftener when the importance of an accurate appraisal of the entire pathologic picture is more fully appreciated.

Pathologically the tumors fall into 3 major categories: papillary, epidermoid and undifferentiated carcinoma (the poorly differentiated varieties in the papillary and epidermoid groups should be recorded). It should be borne in mind that a section showing a well differentiated carcinoma in one area may show undifferentiated cells in another area of the same tumor. The cellular appearance alone of an infiltrating carcinoma indicates neither the presence nor the absence of metastasis. However when the neoplasm is deeply infiltrating the poorly differentiated papillary carcinomas metastasize in nearly 50 per cent of the cases, the poorly differentiated epidermoid carcinomas in at least three-fourths, and the undifferentiated carcinomas in practically all the cases.

Cystoscopy biopsy and bimanual palpation are important specific diagnostic procedures. A properly taken biopsy specimen is a good sized piece of tissue that includes some muscularis, removed preferably with a cold rongeur. In pedunculated tumors the piece should be taken immediately beneath the base of the pedicle. The inclusion of some muscularis establishes the presence or absence of infiltration as well as the diagnosis of the growth. Biopsy alone does not furnish a clue to the prognosis because the removed piece of tissue is a small part of the whole neoplasm.

Bimanual palpation will detect the stony, hard induration encountered in over 80 per cent of cases of deeply infiltrating tumors. This examination will segregate this group of tumors from the superficially infiltrating tumors which practically never cause stony induration.

Deeply infiltrating tumors are associated with a high incidence of metastasis. Where these tumors are poorly differentiated, they probably have metastasized in nearly all cases. In superficially infiltrating tumors the incidence of metastasis is low except perhaps in the case of undifferentiated carcinomas.

In the absence of metastasis and extravascular extension, a good prognosis will depend on complete destruction or extirpation of the neoplasm and adequate treatment of any future recurrence.

ROBERT TURELL, M.D.

Marshall, Victor F.: Cancer of the Bladder. *J. Am. Med. Ass.* 947 34 50.

The author compares the results obtained from radiation therapy with those of surgery for cancer of the urinary bladder. After a fairly extensive trial the results of radiation therapy with the armamentarium now available have been found to be generally poor.

The fact that obliteration of the endolymphatic duct to this extent did not appreciably affect the volume of endolymph in the remainder of the system in a period of 3½ months rules out the hypothesis that hydrocephalus of the labyrinth can be attributed to impairment of function of this structure.

JOHN F. DEXTER, M.D.

NECK

Seidlin, S. M., Marinelli, L. D., and Oshry, E.: Radioactive Iodine Therapy. *J. Am. Med. Ass.* 1946 13: 838.

A patient was completely thyroidectomized for malignant adenoma in 1923 and 15 years later hyperthyroidism and severe back pain developed. In October 1939 a pulsating metastatic thyroid adenocarcinoma was removed from the region of the twelfth thoracic vertebra. The hyperthyroidism continued to progress for the next 3 years, and metastases were demonstrated with x rays in the lungs, the right femur, the second rib on the left side, the left ilium, and the skull. Roentgenological therapy was ineffective. In March, 1943 a tracer dose of radiiodine was shown to be taken up by all the metastases. Between May and August, 1943 a total of 1.5 milligrams of I^{131} (half-life 8.1 days), prepared in a cyclotron by bombardment of tellurium with deuterons, was given as sodium iodide in water. The estimated dose to the tumors was 10,600 equivalent r and to the blood 70 equivalent r.

Most of the radioactive iodine was taken up by the metastases. Time-concentration curves were constructed for the tumor, blood, and urine. Additional treatment in April, 1944 and March 1945 resulted in relief of the pain and the patient was in good condition at the time of the report.

CURTIS H. TINKER, M.D.

Bartels, E. C., and Bell, G. O.: Thioracil. Preoperative Use in 404 Patients with Severe Hyperthyroidism. *West. J. Surg.* 1947 55: 39.

Thioracil was used during the last 3 years in the preoperative treatment of 400 patients with severe hyperthyroidism. These patients represent about 55 per cent of all patients having thyroidectomy for hyperthyroidism. All patients were not prepared with thioracil therapy. Three hundred thirty-eight cases were classified as primary hyperthyroidism, and 62 were classified as toxic adenomatous goiters. Table I shows the breakdown of evidence of severe hyperthyroidism. Table II shows a breakdown of the significant complicating diseases in 400 cases.

Thioracil was administered in a total daily dose of 0.6 gr. It was found that full control of hyperthyroidism is essential before thyroidectomy. If full does not take place, then any of the usual may arise. Thioracil treatment should be individualized. Roughly it was found that 1 day of thioracil treatment was needed for each percent age elevation in the basal metabolic rate. A patient

with primary hyperthyroidism of short duration, and one who has had no iodine, will have a daily drop of about 1.5 per cent in basal metabolism. Patients with primary hyperthyroidism of long duration or of short duration who have received iodine therapy, will have a daily drop of 1 per cent in basal metabolic rate.

Patients with adenomatous goiters, who have had no previous iodine therapy will show a 0.64 daily drop in the basal metabolic rate. Patients with adenomatous goiters who have had previous iodine therapy will show a 0.45 daily drop in the basal metabolic rate. At surgery the thyroid gland was found to be very soft and vascular when only thioracil had been given preoperatively. To overcome this difficulty Lugol's solution was combined with thioracil, thus making the surgery more satisfactory. Table III shows the reaction to thioracil in 400 cases. A total of 35 cases showed white blood cell depression, fever, skin eruption, edema of the skin or swelling of the salivary glands. A chart is included, which shows the time of reaction to thioracil. The time of onset of reactions varied widely except for the fever reaction which occurred on the ninth or tenth day. Both total and differential counts are necessary and these are repeated at 7 to 10 day intervals during thioracil therapy. When agranulocytosis develops, energetic penicillin treatment is advised as protection against infection during the vulnerable period. Of 13 patients sensitive to thioracil, 12 tolerated thiobutyl. The advantages of thioracil preparation are that the patient is restored to a normal state of health for thyroidectomy, the need of multiple stage operations is eliminated, and the treatment has practically abolished mortality. Also, the postoperative course of the thioracil-treated patient is less stormy.

Two hundred sixty-six patients have been followed from 6 months to 3 years following thyroidectomy. Among these there have been 3 cases of recurrent hyperthyroidism, 8 patients have persistent postoperative myxedema, there have been 3 cases of unilateral cord paralysis and 3 patients have developed progressive exophthalmos. There was 1 postoperative death and 1 death from agranulocytosis due to thioracil, a mortality of 0.5 per cent.

RICHARD J. BENNETT, JR., M.D.

Rose, E., and McConnell, J.: Thioracil in Thyrotoxicosis—Results of Prolonged Treatment in 25 Cases. *Am. J. Med. Sc.* 1947 13: 74.

The authors' patients were under observation for from 10 to 30 months. On the basis of results, they were grouped as follows:

Group 1 includes 16 patients in whom sustained remission followed the cessation of thioracil therapy. There were 15 females and 1 male. Three patients were in the second decade of life, 1 patient was in the third, 3 patients in the fourth, 6 in the fifth, 5 in the sixth and 1 patient in the seventh decade. Thirteen patients were under observation for 1 year or more, and 8 for more than 2 years. There were 15 with diffuse goiter and 1 with nodular goiter. The longest period of treatment with thioracil was 10.6 months.

however it is believed that this method of treatment should not be discarded because of the cure obtained in the occasional case and the palliation it affords, especially in the late metastasis. On the other hand surgical methods (mainly resection of the bladder with or without ureteral reimplantation or total excision of the bladder with diversion of the urinary stream, transplantation of the ureters to the skin or uretero-intestinal anastomosis) will result at the least, in a small increase of 5 year successful results, a moderate improvement in average survival and a really significant amount of palliation as compared with the results obtained by radiation methods.

In some cases it is advantageous to use both forms of therapy particularly after the obvious failure of one.

ROBERT TURNER, M.D.

Lewis, L. G. : Repair of Rectourethral Fistulas. *J Urol.*, Balt. 1947 57 1173.

Lewis employed the Whitehead principle of advancement of the rectum in the successful repair of 13 patients with rectourethral fistula following wound ing by combat missiles. The communications were between the membranous or prostatic urethra and the rectum in all cases. In 5 patients multiple communicating fistulas were present. In all but 1 case, suprapubic cystostomy and abdominal colostomy had been performed shortly after injury.

The patient is placed on the operating table in an exaggerated lithotomy or perineal position spinal anesthesia is employed. For repair of a simple fistula with an intact anal sphincter an annular incision is made around the anus at the mucocutaneous juncture and the entire operative procedure is carried out through the dilated anal sphincter. When the anus is ablated the scar is completely excised and a plastic closure is made. The anal mucosa is carefully dissected from the external anal sphincter, the entire rectum is freed laterally posteriorly and anteriorly and the fistulous tract is divided until the rectum can be brought down without tension to bring the rectal fistulous opening outside of the anal margin. The middle hemorrhoidal vessels must be divided and ligated. It was found necessary in all instances to free the rectum beyond the prostate to the base of the bladder. Then the urethral fistula is excised widely.

Several No. 1 mattress sutures of No. 1 chromic catgut are used to close the urethral defect. Except in cases of urethral stenosis (in which the scar surrounding the urethra is excised) no retention catheter is used. Most important, 6 stay sutures between the rectal wall and the perineal walls, 1 inch above the anal sphincter, must be inserted.

A Penrose drain is brought out posteriorly to the new anal margin or through a posterior stab wound. The rectum excess is excised and the anal mucosa is sutured to the marginal skin with interrupted silk. The levator ani muscles are sutured together in the midline anterior to the rectum when possible, but no attempt to interpose perineal tissue between the urethra and rectum is made otherwise.

DAVID ROSENTHAL, M.D.

Burnier E.M.P. Cancer of the Penis (Cancer do penis) *Rev brasil cir.*, 1946, 15 513 1947 16 43 89.

Of 3 500 patients with cancer treated at the National Cancer Dispensary 73, or 1 per cent had a malignant tumor of the penis. If only operable cases are considered the percentage rises to 5 per cent. Contrary to the statement that cancer is a disease of old age cancer of the penis usually occurs in middle age at the height of sexual activity. Fifty three and four tenths per cent of the author's material were men under 50 years of age.

Veneral diseases, trauma erythroplasia (corresponding to leucoplasia of the oral cavity) and congenital phimosis have been mentioned in the literature as causative factors. Repeated cancerization of papillomas may according to some authors be responsible for a malignant degeneration of a benign lesion. In 30 of the 73 cases there was congenital phimosis and in 13 a long prepuce in 6 both congenital phimosis and trauma were recorded, in 10 phimosis and papilloma were present, in 1 the history mentioned trauma and in 12 no predisposing factor could be established. In regard to the location cancer of the penis may be divided into two groups (1) superficial originating from the skin or mucosa of the glans or the prepuce and (2) deep developing in the corpus cavernosum of the penis or corpus spongiosum of the urethra. As a rule cancer of the corpus cavernosum is secondary to superficial cancer. In the author's material the cancers were found most frequently in the glans the prepuce and the balanopreputal sulcus, in the order given.

From the clinical point of view the following three forms may be distinguished (1) the papillary hypertrophic form which is most frequently observed (2) epithelial ulcer or the cirrhotic form, and (3) simple infiltration of the glans.

Histologically four types of cancer may be distinguished (1) spinocellular, which is quite radio-resistant, (2) basocellular (3) mixed, and (4) transitional. The first type rapidly invades the regional glands and destroys the organ. The second type corresponds to the clinical ulcerative or infiltrating form rarely produces lymphadenopathy and shows a slow evolution. While the first type is encountered in 80 per cent of all cases the basocellular form is present only in from 0.5 to 10 per cent of all cases of cancer of the penis. The transitional type of cancer originates from the mucous membranes and as a rule is radiosensitive.

Sarcomas and endotheliomas of the penis are very rare. Only 1 sarcoma was encountered by the author in this group of 73 cases.

Biopsy should be done in each instance to avoid diagnostic errors. Serologic reactions are not dependable. A primary syphilitic lesion balanoposthitis ulcus molle erysipelas of the prepuce chronic cavernitis elephantiasis of the penis, tuberculous actinomycosis syphilitic gumma papilloma granuloma venereum, and erythroplasia must be considered in the differential diagnosis.

If the lesion is confined to the glands or the prepuce, no palpable glands are present and the histologic examination establishes the diagnosis of a basocellular lesion electrocoagulation or radiotherapy may be sufficient. If the process invades the corpora cavernosa, partial or total amputation of the penis is indicated. If the scrotum is involved it may be necessary to remove it and to implant the urethra in the perineal region. If glands are involved they should be removed through an inguinoocutaneous incision.

If the testes and epididymis are affected emasculation may be required. Hormonal therapy may be tried postoperatively. If the glands are not palpable at operation the author prefers postoperative x-ray treatment to surgical removal. If the involvement is considerable, electrothermic extirpation should be followed by postoperative irradiation. If craterlike ulcerations adherent to the adjacent tissues are present in the region of the lymph glands no x-ray therapy is employed because this histologic type is usually radioresistant and because the absorption of toxic products may aggravate the condition.

If the lesion is very small well circumscribed and free of infection radium treatment is indicated. Superficial x-ray therapy from a short distance also gave excellent results in selected cases in which the lesion was small and mutilation by an operative procedure had to be avoided. X-ray therapy is also being used by the author for prophylactic purposes after electrocoagulation or extirpation of the tumor with an electric knife. Electrosurgery is always employed by the author in place of a scalpel for dissection of the tumor. JOSEPH K. NARAZ, M.D.

GENITAL ORGANS

Seeman, J. A., Connolly A. J. and Egnatz, N.: Cancer of the Prostate. *J. Urol.*, Balt., 947 57 1158.

The authors studied 100 cases of cancer of the prostate, in which 64 of the patients died and 36 remained alive for from 1 to 5 years after first being seen. Eight were subjected to castration alone, 26 were given estrogen alone, and 64 had a combination of estrogen and castration.

Most of the patients gained in weight, became more responsive, and had a decrease in anemia and an improvement in appetite. The pain was relieved the difficulty in voiding decreased, and the size of the prostate diminished remarkably in many instances. Usually it took 2 months for the improvement to be appreciable. Some of the patients received diethyl stilbestrol, 3 mgm. 3 times daily for a week and then the dose was reduced to 1 mgm. 3 times daily others received 1 mgm. 3 times a day indefinitely.

The authors re-emphasize the importance of routine rectal examinations on every male patient over 45 years of age. Additional diagnostic measures are transurethral biopsies, roentgenograms of the bones, serum acid phosphatase studies, determination of the sedimentation rate, and the Papanicolaou fixed smear technique of prostatic secretion. Scatoma in a man over 45 should be suspected as being caused by

prostatic cancer. When the diagnosis is made, complete urological examination should be done and an internist should study the pulmonary cardiovascular and gastrointestinal systems. At present, the treatment of choice is castration plus estrogen. The problem is one of pluriglandular nature which is not yet well understood. DAVID ROSENBLUM, M.D.

Goldstein, A. E.: Extrurethral and Extravesical Perineal Prostatectomy. *J. Urol.*, Balt., 1947 57 1145.

Goldstein offers a modification of Young's perineal prostatectomy in which the adenoma is removed extraurethrally and extravesically without opening of the urethra except for the urethrotomy incision for the tractor. The dissection is made between both urinary sphincters. A retained urethral catheter is employed and a pack for coxing, and not for urinary drainage, is introduced. When large median lobes are observed cystoscopically the operation is not attempted. The author employed the operation in 36 selected cases, and a definite decrease in mortality and morbidity rate was obtained.

For the most part the operation is the conventional perineal prostatectomy with some changes. An incision about 0.5 cm. in length is made in the upper portion of the prostatic urethra after its preliminary exposure by the conventional perineal technique. A straight Young or Lowsley tractor is inserted, the blades are opened, and the prostate is drawn forward. Beginning at the upper border of the prostate on each side a longitudinal incision about 1 cm. in length is made in the prostatic capsule alongside of the urethra. The width between the two incisions is approximately 1.5 cm. The capsule is now separated from the adenoma with a blunt dissector and the index finger. Anteriorly the prostatic adenoma is separated from the anterior commissure by gently cutting the tissue between the adenoma and the anterior commissure to the bladder with a straight scissor. This also separates any anterior lobe hypertrophy that may be present. Now with the index finger behind the prostatic lobe, the instrument in the urethra is palpated. At this point a careful deliberate attempt is made to dissect the adenoma from the urethral wall. With scissors or a scalpel the adenoma which is attached to the urethral wall on each side is incised, and the lobe is gently and gradually separated medially from the urethra. This should be done carefully without tearing or pulling. Each lobe can now be delivered from the cavity. More care is taken in carrying out this procedure than in the conventional perineal prostatectomy. In separating the adenoma from the urethral wall a small opening may be made accidentally. Should this occur, no attempt is made to close it. Each lobe is removed separately.

At the completion of the removal, the prostatic cavity is examined, particularly along the urethral wall. The wall is very thin. Small tags of prostatic tissue clinging to the wall may be removed by sharp dissection. If a median lobe is present it can be removed with one of the laterals or a dissection is

made between the capsule and the urethra. The tractor is removed the internal sphincter is dilated if necessary and a soft rubber 22 F catheter is introduced. One No 1 chrome catgut suture closes the urethrotomy incision and the prostatic cavity on each side is closed similarly. For oozing a pack of gauze of oxycellulose is inserted.

Healing should be hastened because of the pressure of the urethra. In most instances the patient was allowed out of bed between the third and sixth postoperative day. Careful adjustment of the retained catheter played a very important part in the healing of the wound per primam as well as the amount of postoperative perineal urinary drainage. The catheter was kept in from 10 to 12 days. In 60 per cent of the cases the wounds were closed within 10 days and in 77 per cent they were closed within 17 days.

The average postoperative hospital stay was 22.6 days. In 5 cases there was an average incontinence of 14 days. The mortality was 2.8 per cent (1 death in 36 cases).

DAVID ROSENBLUM M.D.
SOUTHERN BRIT. M. J. 1947: 1, 917

Soutter H. S.: On Complete Removal of the Prostate. *Brit. M. J.* 1947: 1, 917

The author discusses a method of completely removing the prostate the operative approach being retropubic. The method was evolved quite by accident when he found in doing a retropubic prostatectomy that the prostate had separated from the triangular ligament. He was able to visualize the prostatic urethra which much to his surprise measured about 4 cm. The urethra was then cut close to the prostate and the prostate was then cut the bladder neck after the seminal vesicles had been divided. The bladder neck was sutured to the prostatic urethra and the bladder was further attached to the triangular ligament.

The operation which the author is now employing and which is fundamentally that described with some technical additions is discussed in detail. The article is diagrammatically illustrated which aids considerably in the clarification of the approach and the anatomical structures encountered in the retropubic space.

ROBERT LICK, JR., M.D.

McLaughlin W. L., Holyoke, J. B. and Bowler J. P.: Oliguria following Transurethral Prostatic Resection. *J. Urol.*, Balt. 1947: 58, 47

The oliguria syndrome usually occurs in the so-called good risk patient, who has neither serious cardiovascular nor renal disease. The individuals who develop the type of postresection oliguria under discussion in this article appear to fall into two main groups. The first group includes the patients whose resection has been characterized by excessive bleeding and in whom a prolonged attempt has been made to control the bleeding by fulguration. Such uncontrolled bleeding is nearly always venous in origin and results from cutting through a large venous sinus in the prostatic capsule. Extensive fulguration may tend to increase the bleeding by enlarging the open

ing in the sinus. The second group includes the patients in whom an actual perforation of the vesical neck prostatic urethra or bladder wall has taken place.

Oliguria or even anuria may be present from the time of resection. In many patients, however, the decline in urinary output begins during the second and third 24 hour periods following resection. Subjectively the patient may feel entirely well but usually he complains of anorexia and nausea. Frequent urination is hiccuping and vomiting. Mild jaundice occasionally develops. The scanty urinary drainage is often dark brown or black. Once a state of oliguria or anuria has become established nitrogenous wastes in the blood accumulate. Very occasionally a patient who has bled excessively or who has had a perforation will become uremic without showing a decrease in urinary output. The extreme dilution of the urine in these cases is further evidence of the severity of the renal damage.

Oliguria following resection is not an irreversible state. An occasional patient may have only a brief period of decreased urinary output and then go on to complete recovery. It is also true that many patients with excessive bleeding and perforation do not develop oliguria and uremia. A small percentage of the patients who have perforation go into shock and die within 48 hours. Unfortunately we have no figures on the incidence of these aspects of the problem.

JOHN A. LOREY M.D.

Murray Oscar B. and Ewert, Earl E.: Malignant Disease in the Undescended Testis. *Surg. Clin. N. America* 1947: 27, 709

In reviewing the literature it was definitely established that the incidence of malignant disease of the testes is markedly accelerated in testes that are undescended. In one series of 604 cases of undescended testes 11 per cent were malignant. Cancer of the testes in over 11 per cent of the recorded cases indicates a correlation 48 times greater than expected by chance association. In patients with cancer of one testis and unilateral cryptorchidism 97.5 per cent of the tumors were in the ectopic testis. In bilateral cryptorchidism with unilateral testicular cancer, whereas in the second testis developed in 24 per cent, second testicular tumor developed in the scrotum, 4 of the cases. Thus, the frequency of bilateral involvement of the ectopic testis is 32 times that of the scrotal testis.

In view of these facts the authors believe that the ectopic testes must be regarded as potentially malignant tumors and that if the unilateral ectopic testis cannot be replaced in the scrotum it should be removed.

During the last 5 years at the Lahey Clinic Boston Massachusetts there have been 50 cases of ectopic testes. During this same period 14 patients were seen with testicular tumor and in 4 of these 14 the tumor was in the undescended testis, an incidence of over 28 per cent. An average period of 15 months elapsed from the time the patient first noticed the swelling

until be presented himself for treatment. The age group was from 30 to 50 years. The Aschheim Zondek test is helpful only when positive. Diagnosis is based on a painless swelling of the scrotum.

JOSEPH E. MAURER, M.D.

MISCELLANEOUS

Prien, E. L., and Fromdel, C.: Composition of Urinary Calculi. *J. Urol.* Balt. 947 57:949.

The authors, realizing the similarity between urinary calculi and minerals have applied techniques of mineralogy to the identification of crystalline components to supplement chemical analysis which is well known to be inadequate. The use of the polarizing (petrographic) microscope and x ray diffraction techniques as applied to urinary calculi identification are described in considerable detail with a brief historical résumé.

Approximately 700 calculi were studied only 4 of which could not be identified by optical methods. This was probably due to intimately mixed foreign matter so that no other method of accurate analysis could be used but roentgenography. The great advantage of this method (x-ray diffraction) is that it affords an accurate method of analyzing calculi in respect of size contamination with organic matter, and complexity of phosphates.

Fundamentally the optical method is based on the transmission of polarized light through transparent grains the light changes then being measured and becoming constants of this particular substance. The x-ray method is one of recording the diffraction of monochromatic x rays photographically but this method is clinically impractical because of its expense and consummation of time.

The authors present detailed tables of optical constants with the appearance and association of the various substances in urinary calculi. In regard to the x ray diffraction method there are presented determinative tables and x ray diffraction photographs showing x ray spacing. The article is extremely well illustrated, presenting a very complex subject with unusual clarity. An analysis of the calculi studied is presented and their incidence computed in this series. It was found furthermore that supposed constituents of urinary calculi as reported in chemical analysis were nonexistent.

ROBERT LICK, JR., M.D.

Suby, H. L. and Suby, R. M.: Experimental Production of Renal Calculi. *J. Urol.* Balt. 947 57 995.

Using rabbits as test animals, the authors carried out several experiments to note the effect of the intravenous injection of urea splitting organisms on the urine pH of rabbits with normal and with hydronephrotic kidneys, and to obtain a favorable method of producing pyelonephritis and renal calculi in animals to simulate this disease in man.

Organisms recovered from the urine of patients suffering from calcium phosphate urinary calculi

were injected intravenously in rabbits in which an artificial hydronephrosis had been induced. The technique of producing this is described. Following the operative procedure the pH of the rabbits urine was observed for a control period of from a to 7 days and was found to average from 5.5 to 6.5 as measured by nitrazine paper. The animals were then given an intravenous injection of 0.35 c.c. of a saline suspension of 18 hours growth of bacteria grown from the urine of a patient with calcium phosphate kidney stones. Immediately following the injection of urea splitting organisms the urine became strongly alkaline. These urinalysis and pH determinations were followed closely and roentgenograms were taken at weekly intervals. Animals injected with bacteria which did not split urea developed a urinary infection but the urine continued to be acid. Rabbits which had normal urinary tracts when injected with urea splitting organisms voided a markedly alkaline urine for from 12 to 24 hours but the urine then again became normal and acid.

Hydronephrosis was induced in approximately 60 rabbits and various degrees of stone formation were obtained. The authors conclude from these experiments that certain bacteria after entering the urinary tract possess the power to split urea, form ammonia, and alkalize the urine this has been a common clinical observation. A similar pathological sequence was produced experimentally in rabbits. It was noted that in rabbits with normal urinary tracts, alkalization following infection is usually a transient phenomenon without resulting calculus formation. In rabbits with artificial hydronephrosis, however, infection with urea splitting organisms has produced kidney stones.

ROBERT O. BRANNAN, M.D.

Frutkin, G. C.: Urinary Calculi in Spinal Cord Injuries. *J. Urol.* Balt. 1947 57 997.

The author reports on a group of more than 60 patients with spinal cord injuries. Despite efforts to prevent them, calculi frequently were produced. Intravenous urograms were taken soon after admission and repeated at from 6 to 8 week intervals or more often if a febrile episode arose. Over a period averaging 13 months from the time of injury the author found an incidence of 31.5 per cent of renal calculi in patients with complete transection of the spinal cord, and an incidence of 30 per cent in those with partial transection. The higher incidence in those with complete transection is probably explained by the longer period of bed rest.

Confinement in bed and immobility resulting in stasis and hypercalcaemia may be factors in the formation of calculi, yet routine urograms in bedfast patients with bladder drainage for months showed no dilatation of the kidney pelvis or ureters. When automatic voiding was established there still was no upper urinary dilatation. The authors observation in this group indicates that calculus formation is not due to anatomical change in the kidneys either during a period of prolonged bladder drainage or after some type of bladder function is re-established.

Formation of calculi occurred irrespective of suprapubic or urethral catheter drainage and irrespective of tidal or manual irrigation and during the use of solution M as the sole irrigating solution. Stones that were formed were managed as the status of each patient indicated and the results of surgery even in poor risk cases justifies an optimistic view.

ROBERT O. BEADLES, M.D.

DeVries, J. K., and Buchanan, R. W.: Absorbable Gauze in Urologic Surgery. *J. Urol.* Balt., 1947 57 816.

Oxidized gauze (a cellulose which has been oxidized with ultragen dioxide) when imbedded in body tissues, is completely absorbable in variable periods of time, depending on the amount of gauze used, the amount of bleeding present, and the tissue in which it is imbedded. Photomicrographs are presented to show the gradual absorption of the gauze from experimental wounds in dog kidneys until at 4½ weeks no gauze is discernible. Fifteen weeks after packing only a narrow wedge of fibrous tissue remains where the packing was placed. The material is evidently dissolved, absorbed, and eliminated through the kidney or is taken up in solution by phagocytes.

The gauze was first tried as a carrier for thrombin, but because it is quite acid it tended to inactivate the thrombin. When the gauze is placed in contact with a bleeding surface it turns brown then black, becomes sticky and stops the bleeding. This is due to a reaction between the gauze and hemoglobin, for which it has a direct affinity. Oxidized gauze will not withstand autoclave sterilization. The product is sterilized with formaldehyde.

The authors report their experiences with the use of oxidized cellulose in 8 operations on the kidneys, 48 prostatectomies, and in 2 operations for bladder tumor.

In all instances operative wounds of the kidney were packed with the gauze, and the wounds were closed with mattress sutures, leaving the gauze *in*

situ. Its use was successful in controlling the bleeding in all 8 cases.

The technique used in suprapubic prostatectomy follows the standard operative approach. After enucleation of the gland a 60 c.c. Foley bag is passed through the urethra into the bladder. A square of oxidized gauze, roughly 14 cm. square, is prepared 4 to 6 ply in thickness and is secured over the bag by ties placed distally and proximal to the bag. The bag is inflated with 5 c.c. of fluid and drawn down until it fits snugly in the prostatic bed then is inflated so that even pressure is exerted in the bed. The wound is closed with a silver wire suture extending through the abdominal wall and bladder, and secured on one side with a Davey button. On the opposite side it is untied. The bladder is then closed about a double suction suprapubic tube and the wound is closed in layers. Pressure is released from the bag in 12 hours, and urethral drainage established. The suprapubic tube is removed in 3 to 5 days, at which time the wound edges which had not been secured at the time of operation are brought tightly together and secured with a Davey button. The patient remains practically dry until the time of voiding which varies from the seventh to the fourteenth day.

It is the authors' impression that there is less bleeding with this method than with any method they have previously employed and it is also unnecessary to disturb the wound by the removal of packing. There is usually a dark red or brownish discharge from the catheter which represents disintegration of excess oxidized gauze. In one instance, cystoscopy on the sixth postoperative day showed a clean granulating wound in the prostatic bed with no evidence of gauze adhering to the wound. It is suggested that irrigation with 5 per cent sodium bicarbonate solution be instituted on the third postoperative day to dissolve the oxidized gauze.

There were no cases of secondary hemorrhage and no evidence of pyogenic reaction attributable to the oxidized gauze.

ROBERT O. BEADLES, M.D.

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ROBERT O. BEADLES, M.D.

SURGERY OF THE BONES JOINTS, MUSCLES, TENDONS

CONDITIONS OF THE BONES, JOINTS, MUSCLES, TENDONS, ETC.

Mondor H., and Léger L.: Milkman's Syndrome and Spontaneous Fractures of the Skeleton (Syndrome de Milkman et fractures spontanées du squelette) *J. chir. Par.* 1947 63 85.

Röntgenological examination of bedridden patients with a diagnosis of chronic rheumatism or hysteria will often reveal multiple symmetrical fissures of the bones. These narrow radiolucent lines may be seen in the long bones, pelvis, or ribs, but there is never any evidence to correlate these x-ray findings with trauma. Furthermore, the site of the pain has no bearing on the location of the fissures. In fact, they are often discovered in bones which apparently are asymptomatic. Therefore it is necessary to roentgenograph the entire skeleton in the search for these bony lesions.

Patients localize the pain predominantly in the spine, pelvis, and lower extremities. It is initiated by any physical effort i. e. change of position or by a brisk walk. There is general weakness and the patients very cautiously carry out very simple tasks such as lifting a spoon or turning a page. Some patients become totally helpless. The gait is insecure and often waddling. There are often skeletal deformities, unassociated however with the bony fissures. Kyphoscoliosis of the spine is most frequently seen. One patient seemed to have shrunk 13 cm. in height.

There were no typical laboratory findings. The blood calcium was normal in most patients (elevated in 8 patients) and the blood phosphorus varied from 16 to 103 mgm. per liter. Cholesterol blood sugar, the albumin-globulin ratio, acidity of the urine and urine phosphorus excretion did not show any significant changes. The serum phosphatase was elevated as a rule, the values ranging up to 48 Bodansky units. The basal metabolic rate was found to be elevated in 6 cases (plus 5 to plus 41 per 100). The Wassermann reactions were negative except in 1 patient afflicted with tabes. Surgical exploration of the parathyroids was negative (Milkman).

In view of the negative laboratory and clinical findings the condition is often diagnosed as hysteria. The roentgenograms later indicate organic changes in the skeleton which often are diagnosed as osteomalacia, multiple myeloma, or polyneuritis.

Milkman's syndrome has a number of signs in common with chronic rheumatism, for example, the patient's age, absence of infection, imperceptible yet continuous progression of the disease, limp, limitation of motion, and often bilateral symmetrical affections of the joints. The following signs help to make the diagnosis of Milkman's disease: general ill health and extreme weakness with a lack of clinical findings, apparent obesity, a peculiar gait, severe

pain, rapid progression of the disease, and firm contractions of the abductor muscles of the hip with limitation of motion in the hip joints. The femoral heads become misshaped and the articular space thinned, and periarticular calcifications are often found.

The fissure lines in bone are not true fracture lines in the sense that they have not been caused by an injury; there is no displacement of the fragments, and there is no pain on pressure over the area. These fissures are the result of local changes associated with local decalcification but without interruption of the continuity of the bone. The bony fissures are surrounded by an area of radiolucency and represent "Umhüllungen." The area of translucency is about 1 or 3 mm. wide (Resorptionssäume of Klenboeck) and is perpendicular to the long axis of the bone. The neighboring bony tissues do not show any changes except occasionally a slight change in the trabecular pattern. The periosteum is elevated and forms a sleeve around the fissure such as is often observed around a fracture site where the callus unites two bony fragments. The most important characteristic feature of this disease is the multiplicity of these fissures (from about 8 to 43 fissures seen in 1 patient). The symmetry of the lesions often is remarkable. Every bone may be affected except the skull. In all the patients examined by the authors 110 fissures were seen in the pelvis, (of which 61 were seen in the ischopubic bones), 43 in the femur, 40 in the ulna, 21 in the scapula, 19 in the ribs and 18 in the fibula.

Under the influence of "mechanical factors," lamellar bone is replaced by reticular bone and the fissure appears. It is the authors' opinion that at one given moment a fracture must be present in spite of the absence of subjective symptoms.

Histologic examination of these lesions in the femur showed local bony changes resembling osteoporathrosis, while examination of the lesions in the fibula suggested osteomalacia. The cortex and the periosteum appeared to be thickened at the site of the lesion (Michaelis). In 1 case a complete autopsy examination was done (Milkman). Many diffuse lesions of the cerebral arteries were found, and hemorrhage in the thalamic region, kidneys, ovaries, and suprarenals. Hyaline degeneration of the walls of vessels was also observed.

Roger and Huguet examined a number of roentgenograms of patients affected with Milkman's syndrome and concluded that the condition was skeletal carcinoma metastases in spite of the fact that the primary tumor could not be localized. The differential diagnosis of Milkman's syndrome often offers a great deal of difficulty. Syphilis of the bone often causes fissures in the bones (Bale, Alexander). Observations similar to those referred to Milkman's disease were made by Kienboeck in osteogenesis

imperfecta and by Merle d Aubigny in intrauterine fractures. Similar fissures were observed in von Recklinghausen's osteitis fibrosa. Tiller suggested that there are intermediary stages between true rickets and Milkman's disease.

Osteomalacia and Milkman's syndrome have features a great deal in common, i. e. predominance in females, diffuse bony pain progressive course general ill health and similar therapeutic response. General decalcification of the skeleton is less marked in Milkman's disease. Although skeletal deformities like curvatures of the spine due to collapsed vertebrae and coxa vara are also observed in Milkman's syndrome, they do not form part of the disease entity. Hypocalcemia with normal blood phosphorus, so characteristic for osteomalacia is absent in Milkman's disease.

Rechad Balger compared Milkman's disease with osteopathies due to dietary deficiencies ("Hunger Knochenerkrankung Hunger Osteomalacie"). These 2 conditions have a number of findings in common and many workers indeed feel that they are analogous. The fact has to be mentioned however, that dietary deficiency cannot account for all the signs found in Milkman's disease. Histologic examination of the bony lesions of famine osteopathies showed thinning of the cancellous and compact portions of the bone. Osteoid borders surround marrow cavities filled with an embryonic type of mesenchymal tissue.

March fractures are differentiated by their location and etiology. They have been observed frequently in patients with dietary deficiency rickets and osteomalacia.

Bone grafting procedures and for that matter, any type of surgical intervention is contraindicated in Milkman's syndrome. They were tried in several instances and the fragments remained separated for 4 years and 9 months after the bone grafting procedure. Administration of vitamin D and tricalcium phosphate caused consolidation of the graft and disappearance of pain within a month. Arsenic preparations in combination with phosphorus were used in 1 case with improvement after a few months and cure after 4 years.

Calcium and vitamins are used by most authors. The use of parathyroid extract seems to be contraindicated since it tends to mobilize calcium from the bones into the blood stream. In cases in which metastases are suspected castration by deep x ray therapy is indicated.

The histories, physical examinations laboratory findings, and roentgenograms of 8 patients are described in great detail. GEORGE I. REICH, M.D.

Sherman Mary S.: Osteoid Osteoma Associated with Changes in the Adjacent Joint. Report of 2 Cases. J Bone Surg 1947 29 483.

The article consists of a brief discussion of osteoid osteoma associated with adjacent intra articular changes, and a case report.

The disease is characterized by night pain which may be fleeting or constant, and tenderness and

swelling at the lesion area with joint effusion. The presence of systemic manifestations such as temperature elevation and leucocytosis excludes osteoid osteoma. The roentgenograms may be normal in the early stages of the disease, but they are quite characteristic when the lesion is fully developed. The main portion of the eccentric lesion is radiolucent. The periphery may be marked by a ring of dense bone. The regional bone about the osteoid osteoma may be markedly hypertrophied. It is of interest to note that the lesions fail to grow larger over a period of years, but tend to become increasingly painful and disabling. The treatment of choice is surgical extirpation. In no case has there been any local recurrence.

Microscopically the lesion consists of vascular fibrous tissue with giant cells osteoblasts and osteoclasts. Its stroma may be diffused with an irregular Paget like pattern of trabeculae which exhibit unequivocal properties of osteoid tissue.

Two cases of 33 osteoid osteomas observed at the University of Chicago disclosed a concomitant hypertrophic arthritis. These cases form the basis of this report.

Case 1 was that of a 16 year old girl who had hip symptoms for 2 years. Pain limitation of motion, and loss of 25 pounds of weight were the chief features. Upon roentgenologic examination of her right hip two oval areas of decreased density were noted on the medial aspect of the neck of the femur. Operation revealed marked villous proliferation of the synovial membrane and about 100 c.c. of clear xanthochromic fluid. Marginal osteophytes were also noted on the head of the femur. Bone chips removed from the neck of the femur had the appearance of osteoid tissue.

Case 2 was that of a boy aged 13 suffering from pain in the left elbow swelling and limitation of motion. An increased sedimentation rate of from 25 to 38 mm per hour was noted. His symptoms had been present 3 months when he was first seen. Examination of the aspirated joint fluid and guinea pig inoculation were negative.

A roentgenogram of the elbow showed a slight thickening of the lower end of the humerus, with an irregularity of the ossification center of the trochlea. Conservative treatment did not affect the progress of the disease. Nine months after the onset of the condition the x rays disclosed a round radiolucent mottled bone defect occupying the olecranon fossa. The lower end of the humerus was markedly thickened by reactive bone formation and appeared to have lost its anatomical configuration.

Since penicillin and sulfonamide therapy failed to change the clinical course the elbow was explored. Tissue studies disclosed microscopic changes similar to those noted in the previous case report, i.e. osteoid osteoma.

Final appraisal of both cases seems to indicate that the acute joint symptoms promptly abated following the surgical removal of the osteoid osteoma, and to date they have not returned.

SAMUEL L. GOVERNALL, M.D.

Kristensen, Gerd Schwartx, and Wulff, Ferd.: On the Course of Paralysis in Polio-myelitic Patients. *Acta med. scand.*, 1947 127: 361

The authors analyze their study of a large number of patients severely paralyzed by poliomyelitis.

The 5 muscle grades employed in Scandinavia appear to correspond with those used in the United States, although the exact description of them differs slightly. The analysis is based entirely on clinical data and depends upon the record of repeated muscle tests at varying intervals.

The authors assume that if a severely affected muscle shows no substantial improvement in 3½ months, but nevertheless regains almost full strength in time, this improvement is due largely to regeneration of the conduction system. Improvement after about a year is said to be due to the working up of muscular strength by exercises.

The treatment of all the cases consisted of exercises and training. In very badly paralyzed muscles electrical stimulation was used to keep them in form until they were receptive to active therapy. The Kenny treatment was not used.

Three groups of cases are included in the following summaries:

- 1 Those examined at the beginning of the disease and again in 9 months.
- 2 Those examined at 3½ months and again at 9 months.
- 3 Those examined at 9 months and again in 4 to 8 years.

Of those with muscular power at 0 at the beginning of the investigation, only about 6 per cent of those in the first group can be expected to improve to IV plus V about one half to V, and only about 1 to 3 per cent in the second group can be expected to reach IV plus V. None in group 3 can be expected to reach IV plus V.

Of those with muscular power at I at the beginning of the investigation, about ¾ in the first group can be expected to improve to IV plus V (about one half to V) in group 2 the chance of improvement falls sharply—less than 10 per cent can reach IV plus V. None in group 3 can be expected to reach IV plus V.

Of those with muscular power at II at the beginning of the investigation, about ¾ in group 1 can be expected to reach IV plus V (about ¾ reaching V), about ¾ in group 2 can be expected to reach IV plus V (about ¾ reaching V) and about ¼ in group 3 can be expected to reach IV plus V (about ¾ reaching V).

Of those with muscular power at III at the beginning of the investigation, about 90 per cent in group 1 can be expected to reach IV plus V (about ¾ reaching V), about 75 per cent in group 2 can be expected to reach IV plus V (about ¾ reaching V) and about 60 per cent in group 3 can be expected to reach IV plus V (about ¾ reaching V).

Of those with muscular power at IV at the beginning of the investigation, about 90 per cent in group 1, about 80 per cent in group 2 and about 65 per cent in group 3 can be expected to reach V.

The muscular power is classified as follows: Grade 0 = no contraction, I = palpable contraction, II = deflectional movement against neutralized gravitational pull, III = deflection against gravitation or against slight resistance, IV = deflection against greater resistance, and V = full or almost full strength. IV plus V denotes function useful for the performance of work.

NEWTON C. ALKAD, M.D.

Moberg, Erik: Subcutaneous Rupture of the Tendon of the Tibialis Anterior Muscia. *Acta chir. scand.*, 1947 95: 455

Four case histories which have been presented previously are briefly reviewed. The author has observed an additional 4 cases.

In 2 of the author's cases the history and physical examinations are presented in detail and in these cases no operative interference was carried out. In 1 of these cases, 3 years have elapsed and the patient can walk and run normally. In the second nonoperative case, the end result is not noted.

In the author's third case, an operation was performed and good function was obtained, but the range of movement and muscular power in dorsiflexion is still reduced. In the author's fourth case, the ruptured tendon was sutured and the function of the foot was completely restored. The patient returned to work in 14 weeks.

The author brings out the fact that all of the known cases have occurred in men. These ruptures of the tibialis anterior tendon are localized to the passage under the crucial ligament. Upon examination immediately after the injury when the patient tries to tense the tendon the distinctly visible and easily palpable outline of the tendon is not present. The local symptoms are not very marked and are usually transient. The ability to walk is not lost. Even local hemorrhage and swelling are often minimal. The foot cannot be handled properly and may droop. If this condition is not treated surgically some restriction of movement, reduced strength, and secondary pes planus may be the ultimate result. A suture of the tendon is desirable unless surgical interference is contraindicated. The author suggests a method of repairing the ruptured tibialis anterior tendon when the gap between the torn ends is considerable. Undoubtedly rupture takes place only when there are pathologic changes in this tendon.

RICHARD J. BEHRETT, JR., M.D.

SURGERY OF THE BONES, JOINTS, MUSCLES, TENDONS, ETC.

Haggart, G. E.: The Treatment of Primary Malignant Bone Tumors of the Humerus. *Surg. Clin. N. America*, 1947 27: 77

In suspected malignancy of the humerus the author advises biopsy if the diagnosis is in doubt, but relies on a frozen section study to confirm the diagnosis. If the clinical and roentgenological features strongly indicate malignancy. He treats these lesions, when they are operable, by interscapulo-

Group 3 comprises 13 patients, as follows.

(a) Nine patients who have remained in remission during the administration of small doses of 0.1 to 0.3 gm. daily, but who relapsed when the drug was withdrawn. Of these 1 was a male and 8 were females; the majority were less than 40 years of age. The average duration of thiouracil administration was 1 year and the longest 19.5 months. Three of the patients developed moderately severe signs of edema and congestion of the lids and conjunctiva, and 2 exophthalmos.

(b) Two patients who relapsed when the dose was reduced to 0.3 gm. both of whom had nodular goiter.

(c) Two patients were maintained on small doses, without relapse. The first patient was a woman, aged 69, with nodular goiter, diabetes mellitus, moderate hypertension, congestive heart failure, and a basal metabolic rate of plus 46 per cent. Thyroidectomy was performed at the end of 11 months because of pressure symptoms. The second patient was a man, aged 22, with an initial basal metabolic rate of plus 59 per cent and a diffuse goiter. His goiter decreased in size over a period of 8 months.

Ten of the 13 patients in group 3 were in the third and fourth decades of life, and 3 were in the sixth decade. Eight had diffuse goiter, 3 nodular and 3 recurrent postoperative goiter.

Group 3 comprises 6 patients (1 male and 5 females) who failed to show satisfactory response over periods of 7 to 15 months. Five patients were above 44 years of age. 4 had a complicating disease, such as acromegaly, hypertension, myocardial enlargement, diabetes, epilepsy, and auricular fibrillation.

Five of the 35 patients in the present series exhibited a leucopenia of less than 4,000 white cells per cubic millimeter. One of these, following a period of abstinence exhibited no recurrence of leucopenia when the drug was readministered. One had leucopenia several months after cessation of therapy; this was thought to be due to the hyperthyroidism rather than the therapy. One patient had a severe granulopenia, pharyngitis, and fever. One developed maculopapular dermatosis. CLINTON H. THURMOND, M.D.

Lahey F. H.: Surgery of the Thyroid Gland. *N. England J. M.*, 1947 336 46.

The author's review is based on his experience with between 35,000 and 36,000 operations on 22,000 to 23,000 patients with thyroid disease, during a period of 30 years. The operative mortality was 0.73 per cent and the patient mortality 0.88 per cent. Thiouracil, thiobarbital, and propylthiouracil have been used preoperatively in a recent series of 500 cases, with a patient mortality of only 0.17 per cent. The author believes that these drugs interfere with the elaboration of thyroxine by the thyroid gland but states that the action of administered thyroxine is not altered. At operation, however, the gland is very friable and microscopically has the typical appearance of a toxic, hyperplastic gland, unless iodine is given the last 3 weeks before surgery when the hyperplasia regresses.

At the Lahey clinic, Boston, it is now the practice to discontinue thiouracil 1 week before surgery, to

avoid the possibility of agranulocytosis at the time of surgery. The average stay in the hospital before the thiouracil era (with iodine treatment preoperatively), was 55 days for the 3 stage operation, and 35 days with the two stage operation. With thiouracil and iodine the average stay is 8 days.

Complications due to these drugs are as follows: neutropenia, granulocytopenia, fever, skin eruptions, and enlargement of the salivary glands. These occur in 9 per cent of patients receiving thiouracil and in 28 per cent of those treated with thiobarbital. Experience with propylthiouracil included 60 patients submitted to surgery and 100 in preparation, with 3 showing leucopenia. When these complications occur and the drug is withdrawn until disappearance of the complication, readministration of the drug is associated with a greater hazard of recurrence. Agranulocytosis and neutropenia occurred as late as 8 days after the last dose of thiouracil, and as late as 9 months after beginning administration on as low a daily dose as 0.3 gm. Agranulocytosis is treated with penicillin, pyridoxine, and liver extract with the greatest dependence on penicillin.

Apathetic hyperthyroidism is described as a chronic, low grade hyperthyroidism in older people, usually with only a small increase in basal metabolic rate with myasthenia and loss of weight. Subtotal thyroidectomy results in recovery.

The importance of subtotal thyroidectomy in thyrocardiac disease is emphasized.

Other phases of hyperthyroidism discussed are myasthenia, exophthalmos, diminished liver function, cancer of the thyroid, variations in relations of recurrent laryngeal nerve, intrathoracic goiter, and the use of lipocaine in the control of diarrhea associated with hyperthyroidism. CLINTON H. THURMOND, M.D.

Fig. F A.: The Etiology and Treatment of Cicatricial Stenosis of the Larynx and Trachea. *Semin. M. J.*, 1947 40 17

In a group of 42 cases of cicatricial stenosis of the larynx and trachea, fracture of the cartilages and previous removal of tumors were the most common causes of stenosis. Other less frequent causes were acute infections self-inflicted and accidental severing of the trachea, and the use of nasal feeding tubes.

The stenosis was treated by an open operation, that is by thyrotomy, excision of the scarring, and skin grafting in 27 cases by continuous dilatation with or without incision of the scar in 10 cases, and by repeated incision of the cicatricial diaphragm in 5 cases. The treatment is described in detail.

Prolonged dilatation was carried out in all the cases after skin grafting.

In 24 of the 27 patients treated by skin grafting the lumen is ample, and in 22 patients the tracheotomy opening has been closed. In 3 of the 10 patients who were treated by continuous dilatation decannulation has been carried out. Both of the patients who were treated by repeated incision of a cicatricial diaphragm have, at the time of this report, a free air way.

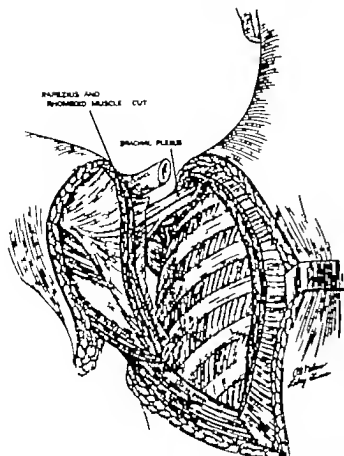


Fig. 1 (Hagart) Completion of posterior muscle dissection. Clavicle has been cut and arm allowed to fall for ward this clearly delineates the brachial plexus and subclavian vessels.

thoracic amputation. Not only has the operation prolonged life in patients without demonstrable metastases, but it has prevented continued extreme suffering when employed simply as a palliative treatment.

The operative technique of Littlewood is preferred to that of Berger. This method does not require the surgeon to work in a deep hole and the subclavian vessels and brachial plexus can be identified and treated relatively simply.

Five cases are presented to show the worthwhile results of this operation. The operative technique is presented with good illustrations.

NEWTON C. MEAD, M.D.

Mellen Richard H.; and Phalen George S.: Arthroplasty of the Elbow by Replacement of the Distal Portion of the Humerus with an Acrylic Prosthesis. *J Bone Surg.*, 1947 29 348.

The authors present 4 cases in which an acrylic prosthesis replaced the distal portion of the humerus.

In the first case it was believed that an acrylic type of prosthesis might be used on the humerus to provide a fulcrum for the elbow joint and still allow early motion in the elbow thus avoiding the long period of time which would be necessary for healing if a bone

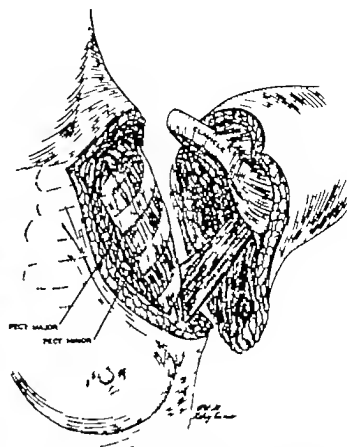


Fig. 2 (Hagart) With exception of the latissimus dorsi all the anterior muscles have been divided. At operation the cut ends of the plexus and subclavian vessels are completely covered by the proximal flap.

graft were used to prolong the humerus. The procedure was carried out with gratifying results.

A similar problem presented itself in several cases of nonunion in the supracondylar region of the humerus. In these cases 3 of which are reported the distal fragment of the humerus was malunited and the elbow joint was fixed by fibrous ankylosis. This mitigated against the restoration of any satisfactory painless motion in the elbow itself after bone grafting of the humerus either alone or in combination with a conventional arthroplasty or resection. It appeared likely that the entire ununited distal fragment of the humerus might well be replaced with a functional type of plastic prosthesis, thus restoring the fundamental principles of the hinged type of joint inasmuch as the proximal portion of the ulna was undamaged and could furnish a satisfactory point of rotation.

The prostheses were made of veronite a methyl and ethyl methacrylate. This material was cast in the form of models which were fashioned after the authors' idea of a functional form for the distal portion of the humerus and did not attempt to duplicate the normal anatomy of the bone. The central hole of the prosthesis was drilled out on a lathe. The size of the central cavity was approximated for each case by

a preoperative measurement of the roentgenograms of the distal shaft of the humerus over which the prosthesis was to fit. At the elbow a standard operative approach was used—usually modified by the type of injury and the presence of previous scars or skin grafts. The prosthesis was secured to the distal portion of the humerus either by tantalum wire or vitalium screws; these were placed through holes in the prosthesis which were easily drilled at the time of operation after the prosthesis had been fitted snugly over the end of the humeral shaft.

Three of the patients described have been followed for periods ranging from 9 to 18 months since the operation. Several striking things have been noted. Immediately after subsidence of the postoperative reaction, motion was restored to the maximum amount obtained, and, as weeks went by, strength in the flexor and extensor muscles improved, but very little improvement in range of motion occurred. This was probably due to the fact that from the start, very little pain was present on motion and at the last evaluation the patients complained of no pain whatever. Furthermore the elbows were comparatively stable.

Inasmuch as the distal end of the humerus is enclosed in this more or less impervious acrylic cap, the fate of this portion of the bone in regard to nutrition and future atrophy is uncertain and will have to be determined by a longer period of observation. The purpose of this report is to stimulate interest in a simple type of procedure which apparently restores motion to the elbow quickly and relatively painlessly. The authors believe that this procedure might possibly be of benefit in ankylosed elbows resulting from rheumatoid arthritis. RUDOLPH S. RANCI, M.D.

Mahoney James H., Phalen, George S., and Frackelton, William H.: Amputation of the Index Ray. *Surgery* 94:7 21 9 5

The index finger ranks second only to the thumb in importance and because of this, surgeons have been taught to salvage as much of this finger as possible when treating an injury affecting it. However in treating a large number of cases on a hand service at an Army general hospital, the authors found that such salvage often resulted in the loss of efficiency in the use of the hand, this being true especially when the index finger was amputated at a point proximal to the proximal interphalangeal joint. In these cases an amputation of the index ray (index finger together with the second metacarpal bone) resulted in the restoration of almost normal function of the injured hand.

Amputation of the index ray is recommended only in patients with normal or nearly normal function of the remaining digits of the hand. These cases fall into two groups: (1) patients with the index finger amputated proximal to the proximal interphalangeal joint, and (2) patients with the index finger so badly damaged that any reconstructive surgery would hold little promise of restoring fairly normal function of the digit.

Time and money are factors which must be considered in deciding whether a finger should be amputated or reconstructed. Instead of spending from 6 to 18 months in a futile attempt to restore the index finger to normal, the patient might find it to his advantage to submit to an amputation of the index ray and return to work within 18 days.

During the past year 18 amputations of the index ray were performed. In every case the dexterity of the hand was improved and the patient expressed satisfaction with the end result. While restoration of an efficiently functioning hand is of primary concern, it is a happy coincidence that the cosmetic appearance of the hand is also improved.

In performing an index ray amputation an incision is made about the base of the index finger extending longitudinally on the dorsum of the hand to the base of the second metacarpal. The second metacarpal is exposed subperiosteally and osteotomized just distal to its base. The base of this bone is not removed because it is desirable to preserve the insertion of the extensor carpi radialis longus tendon. If possible the tendon of the first dorsal interosseous muscle is isolated and inserted into the tendon of the second dorsal interosseous muscle. This tendon transfer increases the power of the long finger to resist pressure from the thumb. The digital nerves are carefully isolated, ligated and buried to prevent the formation of painful neuromas. Through a small separate transverse incision at the wrist, the flexor tendons of the index finger may be withdrawn and transferred into the flexor tendons of the long finger.

Amputation of the index ray narrows the breadth of the palm and this may not be too desirable in a patient who must perform heavy manual labor. However the increased dexterity obtained more than compensates for the slight diminution in breadth of the palm. RUDOLPH S. RANCI, M.D.

FRACTURES AND DISLOCATIONS

Carlquist, Nile: Comparison of the Results from Nonoperative Treatment and from Osteosynthesis by Multiple Nailing of Medial Fractures of the Collum Femoris. *Acta chir scand* 94:7 95 Supp. 127

A survey of the vast literature on medial fracture of the neck of the femur is presented as a background for this study. Until 1939 in the Surgical Clinic of the Lund Hospital all medial neck fractures were treated nonoperatively. Beginning in 1940, the multiple nailing technique of Nyström has been used consistently and a follow-up system has made it possible to investigate the progress of the patients so treated. The author presents a comparative study of the nonoperative cases treated between 1930 and 1939 and the cases treated by the multiple nailing method of Nyström between 1941 and 1945. The studies investigated especially the healing of the fracture and its most common complication—necrosis of the femoral head—under the different methods of treatment.

The material from 1920 to 1939 included 473 patients with fresh medial neck fractures. Active treatment, i.e. reposition under ether anesthesia followed by either plaster cast fixation or skeletal traction, was employed in 73.7 per cent of the group. The primary mortality was 15.6 per cent the chief causes being thromboembolism and pneumonia. Complications consisted primarily of these two conditions plus decubitus. Of this group 73 patients have been re-examined clinically and roentgenographically. Bony union was demonstrated in 72.6 per cent of these cases.

An exhaustive analysis is made of all factors which might contribute to healing both those independent of treatment (age, sex, weight, type of fracture, and degree of displacement) and those dependent on the treatment (interval before active treatment was instituted, character and effectiveness of the fixation, duration of nonweight bearing, duration of total treatment). The only statistically justifiable conclusion derived from this painstaking analysis was that the character and effectiveness of fixation are of paramount importance in securing healing.

Capital necrosis in the healed cases occurred in 24.6 per cent but no tenable contributory factors could be established.

From 1940 to 1945 there were 259 cases of fresh neck fractures admitted of which 161 were treated by multiple osteosynthesis according to Nyström. This briefly consists of nailing with 3 relatively small triangular nails, under local anesthesia followed by 7 or 8 weeks of bed rest during which daily massage and active joint motion are carried out. The primary mortality was 7.2 per cent from the same causes as in group I but these cases occurred during the era of chemotherapy. The operative technique and the early and late complications following treatment are discussed succinctly. The incidence of decubitus was strikingly low in comparison with that in the earlier series.

Of the 134 patients living at the time of this study 128 were re-examined clinically and roentgenographically and only the 83 cases which had been followed up for at least 2 years were included in the results. Bony healing was present in 88 per cent, but 16 of these cases showed only partial osseous healing with capital necrosis in 81.3 per cent of them. In the cases of complete healing there was an incidence of 24.6 per cent of capital necrosis. All of the factors studied in the first group were studied in relation to healing and the occurrence of capital necrosis in this series. Slipping of nails or perforation into the joint were found more often in cases of capital necrosis presumably due to the changes in the character of the head. In 41 per cent of the 83 cases capital necrosis occurred and it was most frequent in the patients who were reoperated upon. Reoperation was usually done because of slipping or perforating nails in the changed femoral heads.

That the two groups of cases are comparable statistically is developed in a detailed study of the age groups and percental distribution.

Initial mortality was halved in the operative group in which not only the availability of chemotherapy, but undoubtedly the early mobilization in bed and earlier getting up play important roles. The mortality after discharge from the hospital was also halved in the operative patients presumably because of the reduced strain of the briefer operative regime on old patients. Less discomfort to the patient, reduction of demand on nursing personnel and shortening of the hospitalization period by an average of 1 month are points in favor of the operative treatment. The higher frequency of healing in the osteosynthesized group was ascertained also the ability of this method to give better fixation and less neck absorption than the nonoperative treatment. Occurrence of capital necrosis showed no significant difference in the 2 methods, ascribable to the fact that probably damage at the time of fracture rather than the type of treatment determine its onset. Clinical results are strikingly in favor of the nailed cases although the fact that the period of observation for these cases is relatively short (2 years or more) is given proper consideration. These findings quite definitely indicate that osteosynthesis is the superior method of treatment in the cases of medial neck fracture.

FRANCIS E. BRECKENRIDGE, M.D.

ORTHOPEDICS IN GENERAL

Abbott LeRoy C. Schottstaedt, Edwin R. Saunders, John B. deC. M. and Best, Frederic C.: The Evaluation of Cortical and Cancellous Bone as Grafting Material. A Clinical and Experimental Study. *J. Bone Surg.* 1947 29 381.

The purpose of this excellent presentation is to evaluate the relative applicability of cancellous and cortical bone as a grafting material. The findings are based upon experimental work, microscopic studies of human grafts and clinical data. Rabbits and dogs were used as follows:

Variable lengths of cortical tibiae from 0.8 to 2.8 cm. long and full thickness bone were used in the first series of 52 animals. The grafts were as follows: 7 of cancellous bone, 5 of cortical bone and periosteum, 8 of cortical bone without periosteum and 12 of cortical and cancellous bone. There were 10 controls, respectively. It was learned that there was very little difference whether the periosteum was in tact or not. At the end of 10 days the cortical bone showed evidence of degeneration. Haversian systems were invaded by granulation tissue and creeping substitution ensued throughout the graft. Observations of the cancellous graft however, disclosed earlier revascularization with moderate disintegration of the trabeculae.

In the second series complete resection of a segment of the middle of the shaft of the radial bone was done, and the defects were filled with grafts from the cancellous portion of the ilium, rib or the cortex of the tibia. Of the initial 64 animals only 35 were acceptable for study. The grafts were as follows: 11 of cancellous bone, 8 of cortical bone and periosteum.

and 6 of bone from the rib there were 7 controls. The authors' conclusions regarding this group were similar to those regarding the previous series.

In the third series excision of the knee joint was performed with supplementary grafts of cortical and cancellous bone. Of 45 dogs 31 were used for the study. Under aseptic technique all knee joints were exposed. The patellae, and the femoral and tibial cartilage were removed. The extremities were immobilized with 2 or 3 Kirschner wires and plaster of Paris casts. The types of grafts were as follows: 16 of cancellous bone, 19 of cortical bone from the tibia with periosteum, 14 of cortical bone without periosteum. There were 18 controls. On the whole the results obtained in this series compared favorably with those of the first two—that is, when cancellous and cortical grafts were used. Experiments in the present series convinced the investigators that cancellous bone is, by far, the most exuberant grafting material which can be used in and about joints. The rapid revascularization of trabeculae by vascular granulation places cancellous bone at the top of the list. Other advantages are: (1) earlier growth of many more osteoblastic cells, and (2) rapid incorporation of the graft with union to the host, and early trabecular deposits of collagen which are lined by osteoblasts.

In the fourth series iliac bone, cortical bone, and bone from the spinous process or the rib was placed in split spinous processes. Eight dogs were used for this experiment. Fifty-four grafts were secured from 6 animals. The ultimate behavior of the cancellous and cortical bone was similar to that observed in previous experiments. However, when the split thickness rib graft and the split spinous process grafts were utilized it was noted that their respective medullary surfaces were promptly invaded by vascular granulation tissue. Creeping substitution over dead trabeculae occurred more rapidly. This diphasic osteoblastic phenomenon contributed largely to an early bone formation, similar to cancellous bone but in contradistinction to cortical bone.

In the fifth series 7 dogs were used. A portion of the tibia was excised. Cancellous transplants were used in a cancellous bed. Iliac bone was the source of the grafting material. In one group of 16 secured specimens, the grafts were not well immobilized.

Sudden death of the bone ensued. This was due to long contact between the grafts and the host. Moreover, when grafts were accurately approximated and immobilization was established, bone union developed rapidly.

The results of the experiments seem to indicate that revascularization of a cancellous graft must of necessity occur within the first 10 or 15 days. Beyond that period survival may be in jeopardy. Specimens of iliac bone at 31, 42, and 60 days, respectively showed insidious, yet progressive, restoration of the trabeculae. Changes in the rib grafts were comparable to those of the cortical and cancellous bone of the tibia, except that the vascular granulation was more prodigious and bone formation equally rapid in the rib. Too rib grafts exhibited a quicker and better attachment to the host. It is also of interest to note that in split rib grafts, revascularization occurs more rapidly than in whole ones. Split spinous process grafts reacted like split rib grafts.

In the summary the authors state that fully matured bone, be it compact or cancellous, behaves the same in nearly all cases. Once such bone is transplanted, for the most part it does not survive. It is inevitably replaced by creeping substitution. The osteogenic power of any graft is found only in the endosteal layer. The rest of the bone is inert. The same can be said of the cambium layer of the periosteum. When a cortical graft receives an inadequate blood supply via its haversian system, failure to survive results. Hence, its main function is one of internal splinting. In the case of cancellous bone, with the many endosteal trabeculae exposed to a richer blood supply and greater osteogenic power, bone formation ensues quite rapidly.

Fat has proved to be an inhibitory element when present in excessive degree in the cancellous grafts. It is well known that it retards bone formation. Cortical bone as a grafting material is most efficacious where strength is of paramount importance. The endosteal layer affords an excellent combination for defects or nonunion of the long bones. For the obliteration of cavities, cancellous bone is recommended. Cortical grafts seldom survive infection. Their ultimate fate is sequestration.

SAMUEL L. GOWERALE, M.D.

SURGERY OF THE BLOOD AND LYMPH SYSTEMS

BLOOD VESSELS

Coller Frederick A. 1 Campbell, Kenneth N.
Berry Robert E. L. Suttler Martin R. and
Others: Tetraethylammonium as an Adjunct
in the Treatment of Peripheral Vascular Dis-
eases and Other Painful States. *Ann Surg.*
1947 125 729

The authors report clinical observations of a large series of patients with peripheral vascular disease who received one or more injections of tetraethylammonium to produce autonomic blockade. Ache ethylammonium ion would block the tetra nerve impulses through autonomic ganglia. The pharmacology is briefly discussed.

The administrations were carried out with the patients placed in a recumbent position and the extremities uncovered the temperature of the room was kept constant (68-75°) and thermocouple record bromide) in a 10 per cent solution was slowly injected. The intravenous doses ranged from 100 to 500 mgm. Intramuscular doses were also given.

The first group of cases reported consisted of patients with a diagnosis of causalgia. Briefly the basis for the authors' diagnosis consisted of a history of sometimes almost insignificant, (2) abnormal or disproportionate prolongation of pain, usually directed peripherally to the hand or foot (3) the occurrence of vasomotor phenomena over a time interval disproportionate to the initial trauma (4) a frequent affection of the morale of the sufferer (5) frequent roentgenographic demonstration of early cystic or late diffuse osteoporosis in the involved extremity (6) cessation of pain and/or amelioration of the clinical picture following blocking or extirpation of the sympathetic ganglia supplying the involved areas. Twenty cases are reported in detail. The authors conclude that the use of tetraethylammonium produced satisfactory results in certain patients in whom sympathetomy would have been desirable but was not believed to be feasible because of the presence of a psychogenic element or an unstable personality.

Nine patients with herpes zoster and postherpetic neuralgia were treated. All received some relief varying from a brief period to 6 hours. The role of vasospasm and the mode of relief could not be explained.

The third group consisted of patients with functional vascular disease. Because the effects of the drug are transient they were of little therapeutic value. In this group and particularly in patients with Raynaud's phenomena, attacks could be aborted or modified but the drug did not replace sympathetomy.

Thirty five patients with thromboangiitis obliterans were studied. The authors thought that the re-

sponses to the injections of the drug could be utilized to gauge the degree of occlusion and collateral arterial circulation and to predict the response of the involved extremities to appropriate sympathectomy. The drug afforded relief of pain in many instances, particularly rest pain and the injection was followed by visible palpable, and measurable relief of vasospasm when clinically present. It was thought that the drug was of no avail in the presence of severe infection or established gangrene. One patient with severe intractable pain was reported to have obtained remarkable relief and to have been converted to a pain-free ambulatory patient.

One hundred and twenty-five patients with peripheral arteriosclerosis obliterans received tetraethylammonium as a diagnostic, prognostic or therapeutic measure. The drug was useful in this group in two respects: (1) it aided in the control of nocturnal pain and (2) it was an index of possible benefits that might be derived from lumbar sympathectomy. Only the occasional arteriosclerotic shows improvement in claudication and established gangrene is not modified.

Twenty-six patients with thrombophlebitis were treated. The pain and edema of acute and subacute cases responded excellently. Patients with chronic thrombophlebitis noted subsidence of the edema relief from congestive pain, and a new sense of well being. The benefits were in no sense curative but provided satisfactory interval relief.

Fifteen hundred injections of tetraethylammonium were carried out without any serious toxic effects. One patient received 42,000 mgm. over a 6 week period. Caution should be exercised in giving the drug to hypertensives particularly those in whom the neurogenic component has been identified or suspected. Nonthypertensive patients in whom an overly labile sympathetic nervous system is anticipated require cautious administration of the drug. Undesirable falls in the blood pressure occur either immediately or after a delayed interval. Myasthenia may occur over a long period of administration but this disappears with the cessation of administration but anuric states the drug is inadvisable.

The authors postulated that the autonomic blockade may alleviate pain by means other than vasospasm namely altered tissue metabolism secondary to sympathetic block, or the blocking of certain afferent pathways in the autonomic nervous system.

W. FORTER MONTGOMERY M.D.

Vaughn, Arkell M.: Multiple Retrograde Saphenous Vein Ligation and Phlebectomy with the Aid of a Malleable Intraluminal Guide. *Surgery* 1947 21 51

In the author's experience high saphenous vein ligation combined with multiple retrograde ligations and excision of segments of the vein is superior to

high ligation and retrograde injection of a sclerosing solution. He reports the following as the basis for this superiority: (1) patients receiving retrograde injections were for the first few days more uncomfortable and disabled than those who had ligations only and (2) recurrences following retrograde injection were often due to incompetent communicating veins, recanalization of the thrombi following injection, or both.

Because the saphenous vein is often more difficult to locate around the knee than in the femoral triangle, a malleable guide was introduced into the lumen of the distal segment of the saphenous vein near the fossa ovalis. This can then be easily palpated and serves as a guide to exposing, ligating, and excising segments of the vein down the thigh and into the calf. This technique is described in detail and illustrated by numerous diagrams. The author recommends the use of longitudinal rather than transverse incisions for these multiple sites of ligation.

EDWARD H. CAMP, M.D.

BLOOD; TRANSFUSION

Brown, Herbert R., Jr.: The Distribution and Use of Human Whole Blood in the Pacific War. *U S Nav M Bull*, 947 47 396.

At the onset of World War II human dried plasma and albumin were made available to the United States forces in adequate amounts but the demand for whole blood became increasingly urgent. At first blood had to be secured directly from service personnel but as demands increased it was necessary to transport and refrigerate whole blood from donors in the United States. The first large shipments of whole blood from the United States donor centers started in August, 1944 for the European theater and in November 1944 for the Pacific theater. The period covered by this report extends from November 19, 1944 to September 21, 1945. The increasing demands for whole blood in the Pacific theater presented special problems of long distances, tropical climates with attendant necessity for refrigeration, the preserving solution, and standard type of equipment. Distances were overcome by granting all whole blood shipments a No. 1 air priority. The refrigeration was maintained through the medium of a 50 cubic foot refrigerated box with water ice, and containing 16 pints of whole blood which could be maintained at a temperature of from 8 to 10 degrees C. for as long as 50 hours. A preservative anticoagulant solution, known as the acid-citrate-dextrose or Loutit-Mollison solution enabled blood to be safely stored and utilized up to 21 days from the date of bleeding and even longer in the case of emergencies. Standard donor and recipient equipment was set up with a bottle, being a vacuum type 600 c.c. bottle containing 480 c.c. of blood and 120 c.c. of anticoagulant solution. Finally studies on transported blood of ages from 4 to 31 days gave early assurance of the safety and practicability of this projected distribution and use.

The procurement for the blood collection program was made the responsibility of the American Red Cross with bleeding and processing being placed under the technical supervision of the Army and Navy. The program for the European Theater of Operation was under Army control and that of the Pacific theater by the Navy. In the operation of the program, all the blood was flown by the Naval Air Transport Service from Oakland, California, to Honolulu where it was received and then flown to Guam where the U.S. Naval Whole Blood Distribution Center No. 1 stored all blood in large refrigerators for a minimum of 12 hours and visually examined all bottles for hemolysis, contamination, and clots, discarding all unsuitable units. Visual inspection proved entirely satisfactory for the entire program. At the time of invasion, LST's were mounted with blood prior to proceeding to the target, and as required a complete blood distribution team would be put ashore with its independent 150 cubic foot refrigerator, a portable electric generator to supply current, an ice machine, and transportation facilities in the form of truck or jeep.

One hundred seventy-seven thousand seven hundred eighty four pints of whole blood were received at Guam from the United States, and a total of 171,564 pints were reshipped accounting for a 3.4 per cent over-all loss at the distribution center at Guam. The total weight of all shipments to Guam was 666,700 pounds or 483.35 tons and required a total of 65,557 cubic feet of plane space for the shipments. The Army in the Philippines estimated their whole blood needs to be 1 1/2 pints per wounded individual. In the Pacific Ocean area the estimates were calculated on a pint per total casualty i.e., killed, wounded, and missing, for a working hypothesis. Both methods were closely correct. It was necessary to estimate the daily requirements in advance. In considering the amount of blood required by different areas the Philippine Islands campaign required 93,086 pints, Okinawa 44,802 pints, Iwo Jima 16,324 pints, fleet units 4,508 pints, and all hospital ships 18,063 pints.

Reaction reports were gathered on a small postal card type of report form. A total of 21,506 reports were returned and of these there were 676 reactions with a resulting reaction rate of 3.1 per cent. In types other than O the reaction rates were above those of the type O recipients, thus lending weight to the desirability of adding types A and B group specific substance in order to neutralize the blood glutinins. It is realized that the optimum age at which blood may be safely transfused is 21 days although blood of 28 days of age and older may be and has been given with safety. It is generally agreed that the rate of red cell deterioration over the 21 day period rises rapidly but that at the 21 day period there still remains about 85 per cent of the initial red blood cell efficiency. The use of type O blood used in the Pacific was highly successful and in only a very few instances were crossmatchings carried out. It is stressed however that when possible

crossmatching is highly desirable and necessary. The highest reaction rate 7 per cent, appeared to be in patients with hookworm anemia. In a separate group of 381 reactions among 12,003 reported transfusions, there were 156 reactions (41 per cent of this series) reported on the cards as being allergic in type.

LEROY J. KLEINERMAN, M.D.

Hedenstedt, Sture: Elliptocyto Transfusions as a Method in Studies on Blood Destruction. Blood Volume, and Peritoneal Resorption. *Acta chir scand* 1947 95 Supp 138.

Since the autumn of 1944 Hedenstedt the author has been engaged in working out a method whereby elliptocytes (elliptical red cells) may be used as labelled corpuscles in studying blood destruction blood volume and peritoneal resorption. The work of this monograph started after the author came across a case of elliptocytosis. By carefully performed transfusion experiments he has attempted to determine the lifetime of red blood corpuscles the blood corpuscle volume, the blood volume, and, finally the resorption of blood from the abdominal cavity.

Elliptocytosis is an anomaly in which the red blood corpuscles are to a large extent elliptical in shape. The condition was first described by Dresbach in 1904. His case was that of a mulatto student in whom 90 per cent of his red blood cells were elliptical. The boy was otherwise normal. The condition is extremely rare occurring about once in every 2,000 or 3,000 people. The anomaly is apparently constant as the elliptocyte count remains the same over a period of months.

Investigations of the osmotic resistance of the red cells are important in distinguishing elliptocytosis from hemolytic anemia. Elliptocytes show normal or increased osmotic resistance as compared with red blood corpuscles in cases of hemolytic jaundice.

In the majority of cases of elliptocytosis described in the literature, the characteristic shape of the red blood cells is the only sign or symptom of interest. The white blood cells and the sedimentation rate are usually normal. Jaundice may be present occasionally. Other blood findings are normal on examination.

The idea of using elliptocytes as labelled blood corpuscles for experimental purposes seems only to have been employed in a few isolated investigations. The determination of the lifetime of red blood corpuscles according to different authors using different methods is reviewed and a wide variation of results is recorded. More recently investigators have tried to approach the problem of the life of the erythrocyte more closely by labeling the corpuscles with radioactive isotopes. Phosphorous, iron and nitrogen have all been employed for this purpose without a final and convincing solution to the problem. A discussion of possible sources of error is presented and reasons for inaccurate results are postulated.

The method of using naturally labelled red cells such as elliptocytes has been sporadically employed

by only a few investigators during the past 25 years. In the author's own experimental investigations he goes into elaborate detail and very meticulous measurements in presenting his technique and results.

By way of summary regarding the results of transperitoneal resorption of elliptocytic blood he concludes that elliptocytic red cells are resorbed from the abdominal cavity into the blood stream through the lymph vessels of the mediastinum at a uniform rate. Resorption of injected blood takes about 8 days. During and after the actual process of resorption the elliptocytic red cells are destroyed in the same way as though they had been injected intravenously (half of them die within 13 or 14 days). Intra abdominal adhesions need not occur even after repeated intraperitoneal injections of blood. Histological studies suggest that in man the red cells are resorbed through stomas into the subepithelial lymph lacunae in the diaphragm.

The author's experimental work is based upon 51 transfusions mostly in children with 10 elliptocytosis. The mixing time for the elliptocytes after transfusion amounts to about 15 minutes. Red cells disappear approximately according to an exponential curve and their half life is 13.1 ± 0.9 days.

The author describes a new method for determining the blood corpuscle weight and blood volume in man with the use of elliptocytes. The results of this unique method reveal the weight of red blood cells to be, on the average, $2.7-2.1$ per cent of body weight. And finally the determination of blood volume with this method is found to be $7.4-7.3$ per cent of body weight. Comparison of Hedenstedt's results with the results of other methods (radioactive phosphorous) reveal a significant difference of values for red cell weight. An explanation of possible reasons for this discrepancy is suggested.

This monograph is clearly presented and represents a novel approach to one of the many unsolved fundamental problems of biology and medicine. It is the culmination of much work well done.

EDWARD F. LEWIS, M.D.

Ginsberg, Harold, S.: Homologous Serum Hepatitis following Transfusion. *Arch. Int. M.*, 1947 79 555

With the ever increasing use of transfusions of blood and plasma the author deems it pertinent to emphasize the frequency of occurrence of homologous serum hepatitis following these therapeutic procedures.

In this article the literature is reviewed briefly. 14 cases of homologous serum hepatitis are reported with a detailed description of 2 fatal cases and their findings at autopsy.

The material presented comprised cases of hepatitis observed at the Seventh General Hospital from September 28, 1944 to November 14, 1944. The date of incubation of the disease as determined from the date from which plasma or blood was administered to the onset of symptoms ranged from 43 to 88 days with an average of 65 days.

The symptoms and signs, in order of frequency were malaise, nausea and vomiting, anorexia, dark urine, abdominal discomfort, jaundice, light to clay colored stools, fever, palpable liver, constipation, generalized aches and pains, chills, pruritus, polymorphic cutaneous rash, diarrhea, and palpable spleen.

The laboratory tests found to be most useful in the early diagnosis were the icteric index or test for serum bilirubin. These were also the most important tests in following the course of the disease. Examinations of the urine for bile and urobilinogen also proved to be useful. The determinations of the total plasma protein content, the albumin and globulin levels, and the prothrombin time were likewise valuable in following the course of the condition. There was a slight to moderate fall of the plasma protein content in all cases studied completely and in 1 case the level fell to 4.5 mgm. per 100 c.c. and the patient developed clinical ascites. In most cases there was a slight fall in the plasma prothrombin level but without need of the use of vitamin K. In the 3 fatal cases vitamin K was administered parenterally but no definite increase in the prothrombin time occurred.

The treatment of homologous serum hepatitis is similar to that of infectious hepatitis. High protein, high carbohydrate, and low fat diet is the basis of

therapy. Extra vitamins were administered in all cases, especially vitamin B complex. During the acute stages of the disease when nausea and vomiting were present, liver plasma, and intravenous injections of dextrose were utilized to supplement the insufficient diet.

The main clinical points of difference between homologous serum hepatitis and infectious hepatitis are the period of incubation, mode of spread, and severity. The period of incubation in the majority of cases of homologous serum hepatitis ranges between 60 and 90 days. Homologous serum hepatitis is spread by the parenteral injection of human blood or its products by means of transfusions, convalescent serums, vaccines, and contaminated syringes. The mode of spread of infectious hepatitis is not definitely known but presumably it may be transmitted by air borne droplets and the ingestion of material, i.e., food and water contaminated by the virus. The severity of homologous serum hepatitis is greater than that seen in infectious jaundice.

Biopsies of material aspirated from the liver during the course of these 2 diseases show that the pathologic changes are indistinguishable and the clinical pictures, likewise, have no definite features to aid in the differentiation of these entities.

JOHN H. MCMANUS M.D.

SURGICAL TECHNIQUE

OPERATIVE SURGERY AND TECHNIQUE; POSTOPERATIVE TREATMENT

Clark, John H.; Nelson, Woodrow; Lyons, Champ; Mayerson, H. S.; and DeCamp, Paul: Chronic Shock; The Problem of Reduced Blood Volume in the Chronically Ill Patient. *Ann. Surg.* 1947 125 618

The authors have introduced the term chronic shock to designate the syndrome characterized by weight loss, decreased blood volume, decreased blood proteins, increased interstitial fluid volume, and increased susceptibility to shock correctable by transfusion and replacement of the blood volume deficit. The purpose of this series of 3 articles is to present the rationale and factual data upon which this syndrome is postulated.

Previous reports emphasized the coincidence of protein depletion and diminished blood volume, but the proof has not been incontrovertible that the latter is the consequence of the former, nor has there been sufficient recognition of the fact that in evaluating the extent of protein depletion an accurate appraisal of the blood volume is mandatory.

Osmotic pressure of the blood protein and tissue tension are the factors which normally maintain the plasma volume in the ratio of 2:3 to the interstitial fluid volume via the interchange of fluid across the semipermeable capillary wall. However, numerous clinical observations relative to a change in this ratio despite an unvaried concentration of plasma protein would seem offhand to invalidate this thesis. Despite the complexity of the mechanism in operation, further consideration reveals the source of this apparent discrepancy.

Protein depletion should, by virtue of the dynamic equilibrium of protein, affect not alone the concentration in the blood but that in the tissue as well. A loss of tissue protein results in an increase in interstitial fluid volume and a reduction of tissue tension. This, then, shifts the burden of maintaining plasma volume solely on the hygroscopically active concentration of the reduced total mass of plasma colloids and consequently diminution of plasma volume follows. Some investigators have emphasized an alteration of the physiologic integrity of the capillary wall. Anemia, reduced total mass of hemoglobin is known to favor a loss of fluid and protein from the vascular to the interstitial fluid compartment.

An analysis of the study of 9 depleted soldiers revealed a lowering of the usual 1:3 ratio, but a correlation did exist of the weight loss, reduced plasma volume, and reduced total mass of circulating blood proteins, both hemoglobin and plasma proteins. This indicates that in patients with weight loss the reduced plasma volume may mask deficiencies in the total mass of both circulating

hemoglobin and plasma proteins. Biochemists have long stressed the fallacy of assuming that solute concentrations reflect the plasma volume. Therefore, appraisal of the weight loss in terms of protein depletion and reduced blood volume permits a more accurate evaluation of the 'poor risk' patient than measurements of the concentration of hemoglobin and plasma protein alone.

To further invalidate criticism of the significance of plasma volume determinations, the ratio of the plasma volume to the interstitial fluid volume as well as serial determinations of the blood volume were studied in 4 normal individual patients. A decided constancy was obtained. This was further emphasized by the demonstration of a return of blood volume to a high level during the convalescence of a depleted patient, an effect repeatedly observed as a prelude to any appreciable recovery in weight.

Thus the concept of chronic shock becomes useful also in the comprehension of apparently conflicting clinical studies and in the formulation of new investigative programs of clinically pertinent problems.

Among the problems engendered by depletion of the body proteins, reduction of blood volume is of prime surgical significance. The purpose of this article is to consider the quantitative aspects of the red blood cell and hemoglobin deficits in chronic shock and the quantitative correction of these deficits by whole blood replacement. This required blood volume determination for as was emphasized above, reduced plasma volume may so mask an anemia as to vitiate the results of such simple determinations as the concentrations of the hematocrit, hemoglobin and red cell count.

Eighty-nine patients with a clinical history of weight loss from malignancy or chronic infection, had initial determinations of body weight, plasma volume, hematocrit, hemoglobin concentration, and plasma specific gravity, 50 having repeated determinations. Sixteen normal subjects were also studied and of these 9 had repeated determinations. All laboratory procedures were carefully standardized.

Normally the blood volume determination can be calculated safely from the observed weight. In the depleted patients, however, the authors found the results to be more reliable when the usual weight rather than surface area or height was used as the standard provided extremes had not existed previously. All cases with weight loss revealed a blood volume reduction approximating 25 per cent and an even greater reduction of red cell mass and total hemoglobin often approximating 50 per cent.

Since the rate of synthesis of new hemoglobin is only to be limited despite its priority on protein known to be limited despite its priority on protein by the administration of whole blood can anemia be corrected rapidly enough to permit urgent surgery. This also deviates available protein to the

more rapidly accomplished synthesis of tissue and plasma protein.

It was found to be clinically practicable in 10 cases to restore the blood volume by transfusion to the standard value for the patient's usual weight (often up to 150 per cent of normal for the observed weight) without evidence of significant hemoconcentration or overloading of the vascular reservoir. Two typical experiments indicated that this increment not only preceded any significant weight gain but was maintained during convalescence as a result of the gain in red cell volume. This supports the significance of the reduced effective blood volume in the patient with weight loss, e.g. chronic shock. Failure of blood volume restorations despite quantitative transfusion therapy indicates continued bleeding.

If blood volume studies are not available the total circulating hemoglobin and red cell mass cannot be evaluated accurately and therefore adequate restoration cannot be accomplished quantitatively. In this event, the authors suggest that since restoration to normal is often attended by definite but asymptomatic hemoconcentration correction of the masked anemia may be attained by transfusion toward this goal. They also found that a hematocrit of 50 per cent consistently indicated restoration of blood volume values to the standard level.

Quantitative correction of blood volume deficits by whole blood transfusions increased the tolerance of the "poor risk" patients for major surgical procedures.

Anemia and nutritional depletion are recognized features of neoplastic cachexia. Progressive anemia is more often apparent clinically than is the loss of tissue protein in the patient with advancing neoplastic disease. Among the factors considered in the genesis of anemia are continued bleeding, nutritional disturbances, bone marrow metastasis, and inhibition from an agent elaborated by the malignancy which may also elaborate a hemolytic agent. The purpose of this report is to present observations on the quantity and quality of the circulating blood in patients with malignant disease.

Blood volume studies were performed on 38 patients with malignancy 23 of whom had repeated determinations. The diagnosis was confirmed in all cases by histologic examination of tissue removed at operation.

Deficiencies of the total circulating red cell mass and hemoglobin were the major factors productive of the reduced blood volume found. The plasma volume deficit was decidedly less marked usually and in general, correlated with the total plasma proteins. Thus the changes are probably the result of deficiencies in red cell mass and hemoglobin without consistent depletion of the tissue protein reservoirs. This would explain why anemia may persist despite the administration of a copious supply of protein if whole blood replacement is withheld.

In malignant disease as in chronic sepsis, there is a fundamental disturbance in hemoglobin metabolism, the nature of which remains to be elucidated.

DAVID H. LORR, M.D.

Rehn, E.: Rational Prevention of Thrombosis to Eliminate Embolism in Surgery (Ueber die rationelle Thrombosebekämpfung in einer emboliefreien Chirurgie). *Dtsch. med. Wschr.* 947 73 18.

Since a strictly clinical approach to the problem of thromboembolism is necessarily limited efforts have been made at the author's clinic to correlate the clinical phases of the problem with chemobiologic studies and to apply these principles as a step toward embolus free surgery. Every surgical procedure of the highest technical perfection is limited by the capacity for response of the subject's organism as a whole. This response may be measured in part by the efficiency of the circulation. Any surgical procedure influences the metabolism and induces changes in the circulation during the period immediately after operation. The sympathetic nervous system, in turn, may be so profoundly affected that disturbances of the system may be manifest immediately and for days after the operation. Operative trauma may lead to shock or to later complications such as collapse thromboembolism and pneumonia. The development and degree of complications depend upon the severity, the kind, and the site of operative trauma, but the stress or condition of the sympathetic nervous system of the patient plays a basic role in postoperative disturbances.

The author recognizes an embolus type, "the patient who has a constitutional predisposition to embolism but who lives a lifetime before the damaging insult leading to embolism occurs. On the other hand a severe disturbance may produce a definite syndrome and tendency toward embolism in a few hours or days. Ordinary factors predisposing to embolism are cachexia following illness or age, hormonal disturbances, severe anemia, uremia, and other severe organic disturbances. The particular surgical lesions associated with embolism are malignant tumors, empyema, diseases of the biliary tract, osteomyelitis and decompensated prostatic hypertrophy. General factors are exhaustion from hunger, thirst, cold and physical and psychical weakness. Another predisposing factor is circulatory lability of central origin from the late effects of influenza and diphtheria. In such cases the electrocardiograph may indicate latent toxic damage.

A more or less definite clinical picture is frequently present but pulse and blood pressure changes may be misleading in the differentiation of some underlying constitutional hazard from shock and collapse. Circulatory phenomena may give a fleeting warning and quickly disappear but they often tend to persist so that they are overcome only gradually or with difficulty. This constitutional hazard is, like shock and collapse, an expression of a determinate condition of the sympathetic nervous system, and its great significance to the surgeon is that it is linked with demonstrable circulatory weakness. Nonspecific tests of the carbohydrate metabolism and the alkali reserve of the blood are of value because their very unspecificity indicates disturbances from a variety of causes, which may lead to thromboembolism.

The fact that obliteration of the endolymphatic duct to this extent did not appreciably affect the volume of endolymph in the remainder of the system in a period of 3½ months rules out the hypothesis that hydrops of the labyrinth can be attributed to impairment of function of this structure

JOHN F. DOLAN, M.D.

NECK

Seldin, S. M., Marinelli, L. D. and Oshry, E.: Radioactive Iodine Therapy. *J. Am. M. Ass.*, 1946, 133: 838.

A patient was completely thyroidectomized for malignant adenoma in 1935 and 15 years later hyperthyroidism and severe back pain developed. In October 1950 a pulsating metastatic thyroid adenocarcinoma was removed from the region of the twelfth thoracic vertebra. The hyperthyroidism continued to progress for the next 3 years and metastases were demonstrated with x rays in the lungs, the right femur, the second rib on the left side, the left ilium, and the skull. Roentgenological therapy was ineffective. In March 1953 a tracer dose of radiiodine was shown to be taken up by all the metastases. Between May and August, 1953 a total of 108 millicuries of I^{131} (half-life 12.6 hours) and 20.5 millicuries of I^{131} (half-life 8 days), prepared in a cyclotron by bombardment of tellurium with deuterons, was given as sodium iodide in water. The estimated dose to the tumors was 10,600 equivalent r and to the blood 70 equivalent r.

Most of the radioactive iodine was taken up by the metastases. Time concentration curves were constructed for the tumor, blood, and urine. Additional treatment in April, 1954 and March, 1955 resulted in relief of the pain and the patient was in good condition at the time of the report.

CHARLOTTE H. THOMAS, M.D.

Bartels, E. C., and Bell, G. O.: Thiouracil: Preoperative Use in 400 Patients with Severe Hyperthyroidism. *West J. Surg.* 94:7 55-59.

Thiouracil was used during the last 3 years in the preoperative treatment of 400 patients with severe hyperthyroidism. These patients represent about 35 per cent of all patients having thyroidectomy for hyperthyroidism. All patients were not prepared with thiouracil therapy. Three hundred thirty-eight cases were classified as primary hyperthyroidism, and 62 were classified as toxic adenomatous goiters. Table I shows the breakdown of evidence of severe hyperthyroidism. Table II shows a breakdown of the significant complicating diseases in 400 cases.

Thiouracil was administered in a total daily dose of 0.6 gr. It was found that full control of hyperthyroidism is essential before thyroidectomy. If full control does not take place, then any of the usual complications may arise. Thiouracil treatments should be individualized. Roughly it was found that 1 day of thiouracil treatment was needed for each percent age elevation in the basal metabolic rate. A patient

with primary hyperthyroidism of short duration and one who has had no iodine, will have a daily drop of about 1 per cent in basal metabolism. Patients with primary hyperthyroidism of long duration or of short duration who have received iodine therapy, will have a daily drop of 1 per cent in basal metabolic rate.

Patients with adenomatous goiters, who have had no previous iodine therapy, will show a 0.64 daily drop in the basal metabolic rate; patients with adenomatous goiters who have had previous iodine therapy will show a 0.45 daily drop in the basal metabolic rate. At surgery the thyroid gland was found to be very soft and vascular when only thiouracil had been given preoperatively. To overcome this difficulty Lugol's solution was combined with thiouracil, thus making the surgery more satisfactory. Table III shows the reaction to thiouracil in 400 cases. A total of 35 cases showed white blood cell depression, fever, skin eruption, edema of the skin or swelling of the salivary glands. A chart is included, which shows the time of reaction to thiouracil. The time of onset of reactions varied widely except for the fever reaction which occurred on the ninth or tenth day. Both total and differential counts are necessary and these are repeated at 7 to 10 day intervals during thiouracil therapy. When agranulocytosis develops, energetic penicillin treatment is advised as protection against infection during the vulnerable period. Of 22 patients sensitive to thiouracil, 11 tolerated thiouracil. The advantages of thiouracil preparation are that the patient is restored to a normal state of health for thyroidectomy, the need of multiple stage operations is eliminated, and the treatment has practically abolished mortality. Also the postoperative course of the thiouracil-treated patient is less stormy.

Two hundred sixty-six patients have been followed from 6 months to 3 years following thyroidectomy. Among these there have been 5 cases of recurrent hyperthyroidism. 8 patients have persistent postoperative myxedema, there have been 3 cases of unilateral cord paralysis and 3 patients have developed progressive exophthalmos. There was 1 postoperative death and 1 death from agranulocytosis due to thiouracil, a mortality of 0.5 per cent.

RICHARD J. BARNETT, JR., M.D.

Ross, E., and McConnell, J.: Thiouracil in Thyrotoxicosis—Results of Prolonged Treatment in 25 Cases. *Am. J. M. Sc.* 94:7 3-74.

The authors' patients were under observation for from 10 to 3 months. On the basis of results, they were grouped as follows:

Group 1 includes 16 patients in whom sustained remission followed the cessation of thiouracil therapy. There were 15 females and 1 male. Three patients were in the second decade of life, 1 patient was in the third, 3 patients in the fourth, 6 in the fifth, 3 in the sixth and 1 patient in the seventh decade. Thirteen patients were under observation for 1 year or more and 8 for more than 3 years. There were 15 with diffuse goiter and 1 with nodular goiter. The longest period of treatment with thiouracil was 10.8 months.

Surgical management of the problem of thromboembolism with clinical regard for the operative risk, the degree of operative trauma and the effects of anesthesia decreased but did not eliminate thromboembolism. More recently attempts have been made to influence the clotting process in the vessels themselves. Many such attempts because of lack of control have failed to prevent embolism or have led to postoperative hemorrhage. The author's clinic has been developing a method which would demonstrate threatened or actual thrombosis and has achieved success by correlating the prothrombin index (PTI) with the clotting time plotting daily values of each on a graph. An increase or release of thrombokinase in the circulating blood augments thrombin formation but the process is not unlimited being dependent upon the prothrombin level. The prothrombin level thus becomes the key to the whole problem of embolism.

It is significant that in a large number of freshly wounded young men who were poor operative risks because of the severity of their wounds thrombosis and, particularly embolism were very rare. This is attributed to the fact that any sympathetic lability in these young men was quickly obviated. The exceptionally rare cases of thromboembolism among recently wounded men can be considered as of constitutional origin. With the development of infection deficiency of liver glycogen decreased alkali reserve and circulatory lability a tendency toward thrombosis appeared and the author was able to demonstrate this with absolute precision through his control test. In addition to the factors of operative risk, disturbances in blood composition, metabolism and circulation emphasis has been placed upon changes in the vessel walls as contributing toward the development of thrombosis. However in more than 300 operations on the major blood vessels including suture and transplantation, there were only 3 cases of massive thrombosis in 2 of which embolism followed. It is significant that thrombosis did not occur at the site of transplantation but at a distance.

Numerous clinical observations signify the importance of certain sympathetic stimuli and disturbances in the development of thrombosis and embolism. This is shown by the frequency with which embolism is associated with atmospheric disturbances and with severe psychic insult. The author regards a spontaneous alkaluria as a manifestation of vasolability and has observed it as a manifestation of a sympathetic reaction associated with psychic trauma. By use of the prothrombin index it was possible to distinguish sympathetic disturbances arising from sympathetic and parasympathetic stimuli respectively. Hyperprothrombinemia is a vagotonic phenomenon while hypoprothrombinemia indicates sympathetic stimulation. Plotting the curve of the prothrombin index gives a true picture of the sympathetic equilibrium or tension which no other method has succeeded in doing, and the author found a definite correlation between the sympathetic tension and the prothrombin index.

Thus, from the standpoint of etiology two forms of thromboembolism can be recognized. The first depends upon tangible factors inherent in operative risk which can be considered as predisposing to thrombosis. These factors are related to disturbances of the metabolism, organic changes, and circulatory abnormalities and are similar to the factors underlying shock and collapse. The second etiologic form lacks these organic and demonstrable abnormalities and has a sympathetic lability as its basis. It is in the latter form that psychic insults and conflicts play an important role. The author believes he has unequivocal evidence that this second form may remain fixed or be obviated. It is difficult to achieve methodical proof but this may possibly be established by further investigations on the relationship between sympathetic stimuli and the prothrombin index.

There are three stages to be recognized in the development of thromboembolism: (1) a predisposition to thrombosis, (2) impending or threatened thrombosis and (3) thromboembolism. The first phase predisposition is conditioned by shock, collapse, operative risk and constitutional factors. The second phase follows through the influence of operative trauma, anesthesia, psychic trauma, atmospheric disturbances, unrecognized sympathetic disturbances and hormonal stimuli. Thromboembolism then supervenes. The curve for the prothrombin index and clotting time indicates the transition from the stage of predisposition to the second stage of impending thrombosis and at this point sufficient time still remains to prevent massive thromboembolism. The curve also portrays the effectiveness of anticoagulation therapy and eliminates the danger of postoperative hemorrhage from overdosage. For immediate effect heparin is administered and for prolonged therapy dicoumarol is used.

Because of wartime necessity the author's clinic functioned in two divisions and the scarcity of anticoagulants led to and permitted the use of anticoagulants in only one of these divisions. Thus, the effectiveness of management in two large contemporary series of cases could be compared and controlled. In a group of 1,596 patients in the one division anticoagulants were used only in those with the strictest indications because of the scarcity of the material. There were 5 cases (0.32%) of thrombosis and 1 case (0.15%) of embolism which ended fatally. Only when the last of the available anticoagulant substance had been consumed did a fatal case of massive lung embolism occur. This patient was receiving dicoumarol preoperatively but therapy had to be discontinued. At the time of operation the curve showed the PTI to be rising and the clotting time to be falling. Postoperatively the PTI and clotting time indicated a propagating thrombosis. On the eighth postoperative day a massive lung embolism occurred and heparin was given but a fatality ensued. The author doubts that giving heparin earlier would have prevented eventual embolism. The case indicates that the critical phase of therapy is prophylaxis

below 6 gsm. on admission. There was a postoperative decline in serum protein in 93 per cent of the cancerous patients as compared with 83 per cent of the noncancerous patients. A lowering of serum protein followed after appendectomy in 69.6 per cent of cases and after cholecystectomy in 81.6 per cent of cases. In 38 per cent of the cancerous patients the low protein level was found to be due to a diminished albumin fraction whereas in 45.3 per cent both the albumin and globulin fractions were diminished. In only 35 per cent of the cases of cancer did the serum protein return to normal levels within the first 10 postoperative days. Postoperative decline in the serum protein was greater in the cancerous patients than in the noncancerous. The fall in the blood proteins can be accounted for on the basis of increased protein catabolism, decreased protein intake, surgical blood loss and possibly the effect of the anesthetic agent. No definite relationship could be established between liver function and the decline of blood protein. Hypoproteinemias were treated during the acute surgical phase by parenteral injection and/or jejunal alimentation. In the author's experience it was not possible during the postoperative phase to prevent the fall in serum protein by either of the latter methods. Serum proteins returned to normal only when the patient was able to take an adequate oral diet.

BENJAMIN G P SEARIGHT M.D.

Noyer, C. A., Levin, M. and Klinge, F. W. *The Volume and Composition of Parenteral Fluids and Clinical Problems of Body Fluid Equilibrium*. South. M. J., 1947 40 479.

Since even normal persons under certain conditions can exhibit well defined alterations in the volume or composition of their body fluids, it necessarily follows that seriously ill patients, not alone those with heart or kidney disorders, can be affected even more markedly. This communication offers evidence which indicates clearly that the non-discriminating use of parenteral fluids can be productive of serious consequences.

The administration of isotonic salt solution to a person deprived of all other sources of fluid may result in sodium chloride retention which, if in excess of 5 per cent of the usual weight will evenuate in signs and symptoms of pronounced illness. This is attributable to a higher concentration of salt by virtue of the diminution of the water volume in the body. The latter results usually from the person's inability to excrete the salt injected in a sufficiently higher concentration in the urine than its concentration in the infusate so that a volume of water equivalent to that lost insensibly through the skin and the respiratory tract cannot be abstracted from the administered solution. The failure to abstract enough water from isotonic salt solutions may also be due to the failure to give enough of it or to insufficient excretion of urine. Among those individuals unable to obtain sufficient water from the quantity of isotonic saline solution usually given (3000 c.c.) are those with severe trauma (operative

and accidental) the aged particularly those with occlusive arterial disease, and those with anemia, malnutrition or cancer.

By the substitution of a 6 per cent saline solution the tendency is lessened for the development of a relative water deficit because of the greater concentration of the glomerular filtrate. This is of significance whenever large combined salt and water deficits need correction. However under certain conditions even hypotonic saline solution will not prevent the retention of salt. A potassium deficit is probably accelerated by the excretion of large quantities of sodium chloride.

Finally a word of caution is given relative to the injudicious employment of glucose or water for these substances have been shown to be capable of producing serious illness whenever amounts are prescribed that are greater than the sum of the insensible loss of water and the maximum excretory capacity of the kidney for water. In the event of water intoxication the authors recommend the use of hypertonic saline solutions (from 3 to 5%) or hypertonic racemic sodium lactate (M/2 or M/3) especially if clinical acidosis is manifest.

DAVID H. LYNN M.D.

Allen, Edgar V.: *Anticoagulants*. *J Am M Ass.*, 1947 134 333

Students of coagulation of the blood must give more attention to the desirability of impairing the ability of the blood to clot within the blood vessels. This statement is emphasized by the observation that hemorrhage causes much fewer deaths than intravascular coagulation of the blood. Experimental and clinical studies indicate that coagulation of the blood may be impaired by anticoagulants with the result that intravascular thrombosis usually can be prevented. Hemorrhage occurs rarely when anticoagulants are used expertly.

What are the requisites for an entirely satisfactory anticoagulant for clinical use? Viewed in the light of present day knowledge the following are required: (1) lack of harmful side effects when used for short periods for months or for years (2) a predictable effect on coagulation of a specified amount of the drug (possibly based on estimation of the blood volume) (3) prompt control of its effect by a 'counter' drug in order to prevent and control bleeding (4) a method of calculating the effect on blood which is simple and rapid which will give consistent results and which can be performed satisfactorily by relatively unskilled technicians or physicians (5) effective oral administration and (6) low cost. The spread between the ideal and practical may be great, and for the time being the medical profession must be satisfied with less than that which is desired.

Heparin and dicoumarol are fairly satisfactory anticoagulants but they have deficiencies which make desirable a continued search for an ideal anticoagulant for clinical use.

The mode of action by which heparin interferes with coagulation of the blood has not been definitely

of the capillaries and venules (3) tubular casts of the products of intravascular hemolysis and (4) lesions due to infection.

The 2 principal pathologicophysologic mechanisms which are believed to cause this damage are shock and intravascular hemolysis. The significance of shock is twofold: prolonged shock produces irreversible tubular degeneration and causes extrarenal uremia. With a fall of the systolic blood pressure of 50 per cent the volume of the blood circulating through the kidney may be reduced 95 per cent. The result is oliguria or anuria with extra renal azotemia.

The significance of intravascular hemolysis is less well understood.

Precipitation of hemoglobin in the renal tubules and hence renal tubular necrosis is primarily dependent on antecedent damage to the tubules and not on the acidity or alkalinity of the urine or the amount of hemoglobin in the blood. This antecedent damage to the kidneys may be produced by ischemia, shock, or chemical poisoning. It is etiologically nonspecific.

There is a striking similarity between the hematuric kidney and the renal observations in other conditions characterized by intravascular hemolysis, such as those following incompatible transfusions of blood, hemolytic reactions to sulfonamide therapy and malaria. The crush syndrome kidney in which casts of a myohemoglobin are present exhibits a comparable picture.

It may be stated that, while the renal lesions following extensive cutaneous burns are usually of a minor secondary and probably reversible character with little danger to the patient in a minority of cases more serious lesions are caused by prolonged shock or by a combination of shock and intravascular hemolysis or by infection, and these may lead to renal insufficiency, renal destruction and death.

HARRY W. FURK, M.D.

Gerahberg, Herbert: Some Observations on War Wounds; with Particular Reference to Stormy Fermentation. *Mil Surgeon*, 1947 100 305

Gas gangrene was studied by laboratory methods after débridement in 170 war wounds. Muscle smears as well as tissue cultures were taken in all of the cases. Cultures were incubated both in a milk media and in Brewer's fluid thioglycolate. Positive fermentation was found in 69 per cent of the wounds of the upper torso and in 70 per cent of the wounds of the lower torso which were in the majority. Muscle smears were positive in 39 per cent of the injured who were subjected to débridement within 12 hours of wounding whereas in those cases with débridement from 24 to 48 hours later positive fermentation occurred in 78 per cent. Muscle smears were of value in determining the relative degree of anaerobic contamination and in the detection of cases of anaerobic cellulitis. In 83 per cent of the smears showing clostridia, *welchii*, diplococcal and streptococcal

forms were also present. Penicillin given preoperatively and prophylactically did not delay the growth of organisms obtained by débridement. Hence the author was unable to evaluate the effect of penicillin in wound prophylaxis. Further of 14 casualties with proved gas gangrene, 8 had received varying amounts of penicillin prophylactically.

BENJAMIN G P SHAPIROFF, M.D.

Aristovskii, V M: Anaerobic Wound Infection. *Am. Rev. Soviet Med.* 1947 4 388.

From experience in the recent war the value of bedside bacteriologic analysis in instances of gas gangrene has been seriously questioned. This stems from such factors as variations in technique and in the failure of bacteriologic studies to provide an early and rapid recognition of anaerobic infection. Moreover, bacteriologists and clinicians are at variance as to the interpretation of findings. Whereas surgeons regard the presence of the *Bacillus perfringens* in a wound with a normal exudate as an indication for energetic treatment against impending gas gangrene the author believes this is unjustified since from 80 to 90 per cent of the wounds containing the *Bacillus perfringens* do not eventuate in gas gangrene. Fundamentally the mere presence of a pathogenic microorganism in itself without concomitant predisposing factors is insufficient cause for alarm. Thus, gas gangrene is a clinical entity for which the bacteriologist may supply supplementary information.

For treatment to be most effective a rapid diagnosis is essential. This has justifiably placed a demand for reports within 24 hours a demand which seldom can be met if accuracy is not to be compromised. It presently requires from 3 to 4 days for a complete report which should include the study of aerobic as well as anaerobic microflora, and not only should a pure culture of the anaerobic agent be isolated from the wound but identification must be made on the basis of morphologic, cultural, biochemical, pathogenic, and serologic properties.

At present the need of a rapid method is admitted. Special media for the *Bacillus perfringens* obviate the need of isolating this organism in pure culture for study but unfortunately no analogous cultural tests for the other agents of gas gangrene are available. The specificity of serologic reactions such as agglutination suggested another method which did not meet expectations because of the great variability of serologic types of pathogenic anaerobes.

The situation is considerably better in regard to the immunologic reactions of gas gangrene toxins, which are characterized as a rule by species specificity (except *Bacillus perfringens*) and are independent of the serologic type. Toxin specificity has been used for rapid diagnosis but it is still too early to judge its clinical value. Preliminary data indicate that the test works in pure infection but in mixed (as in the majority of human cases of gas gangrene) the results are equivocal. Therefore specific toxins cannot be neutralized by antigangrene sera.

DAVID H. LYNN, M.D.

vestibular dysfunction in the different subjects. In the majority the symptoms were incapacitating. The symptoms usually persisted in an acute form for from 7 to 10 days and then subsided almost entirely. The disappearance of the acute symptoms occurred with striking rapidity sometimes within a period of 24 hours. In no instance did complete recovery occur with the subsidence of the acute symptoms. Instead the patients entered into a phase in which the symptoms were absent during ordinary activity but could be evoked momentarily by an unusual stimulus. In general the stage of latent vestibular dysfunction persisted for approximately 60 days and then disappeared. In no instance was streptomycin therapy interrupted because of vestibular dysfunction. A noteworthy feature of the reaction manifested by vestibular dysfunction was the fact that nystagmus was seldom encountered.

Deafness developed in 2 patients. The loss of hearing was virtually complete in 1 person and amounted to more than 50 per cent of total hearing in the other. In both instances the deafness occurred after the repeated intrathecal administration of streptomycin for the treatment of tuberculous meningitis. No tinnitus or impairment of hearing developed during or subsequent to the streptomycin therapy in any other of the 14 subjects. Neurologic examination was otherwise negative in all of the subjects.

Anemia did not occur but leucopenia without granulocytopenia occurred in 2 subjects in conjunction with the occurrence of a drug sensitivity reaction. It is doubtful if this phenomenon represents a toxic reaction to the streptomycin. Thrombocytopenia was never observed. There was no evidence that the administration of streptomycin resulted in any damage to the liver. Visual acuity was not affected.

It is believed that all the reactions are a consequence to the drug rather than to impurities.

The authors conclude that the immediate toxicity of highly purified streptomycin sulfate on long continued administration is sufficiently low to justify the use of the drug in the treatment of serious protracted infections, such as most forms of tuberculosis. However as streptomycin can produce potentially serious toxic reactions, it is inadvisable to use the drug in the treatment of generally benign infections such as recently acquired pulmonary tuberculosis of minimal extent.

LEROY J. KLEINSMITH, M.D.

Flory, Lady; Ross, R. W. N. L. and Turton, E. C.: Infection of Wounds with Gram Negative Organisms: Clinical Manifestations and Treatment. *Lancet* Lond. 1947 1: 855

The effectiveness of penicillin in eliminating gram positive organisms has brought to the fore the problem of dealing with gram negative invaders. At first these were considered of minor consequence in wounds. Yet, even if their toxic effects are minimal when not introduced into vitally dangerous areas the

present report indicates that their nuisance value in impeding repair is high.

This study concerns the observation of 63 lacerations involving bone, only 7 of which were completely closed by secondary suture or plastic repair and 10 superficial wounds. Of the 56 open wounds, 51 were found to harbor 1 or more species of gram negative bacteria from the second week of wounding onward, the other 5 healing comparably to a secondary closure. Since all patients received topical penicillin from the time of receipt of the injury throughout treatment, the gram positive organisms commonly considered responsible for major sepsis were of minor significance. Clostridia were a problem for a short period only.

In the early stages of uncontaminated gram negative infection no deleterious local effects, such as hindrance of epithelial growth were observed nor were there marked constitutional disturbances such as fever, anemia, sepsis etc. Its persistence however caused serious, if at times occult consequences as manifested by a characteristic thin brownish discharge which often possessed a putrefactive odor and by a tendency toward sinus formation and sequestration (21 of 53 cases). Ordinarily if a blood clot remains sterile it forms a basis for the ingrowth of organizing tissues but if infected with gram negative organisms (*Bacterium coli*, *Proteus* or *Pseudomonas pyocyanea*) disintegration steadily occurs leaving no foundation for repair. This appeared to be the reason for interference with the process of bony and soft tissue repair and the lack of union. The 10 surface lesions gave no evidence that gram negative bacteria had any clinical significance. *Bacterium coli* was the earliest invader appearing in 50 per cent of all wounds examined within the first week. *Proteus* appearing most often in the second week, and *Pseudomonas pyocyanea* in the third week or later.

Bacteriological and clinical effects of the daily local application of different drugs and therapeutic agents of promise were observed. Streptomycin was found to be the most effective in removing all 3 gram negative organisms both rapidly and permanently. Sulfathiazole was effective in eliminating *Bacterium coli* and *Proteus* to a lesser degree. Sulfamethazine had a similar effect on *Bacterium coli* and *Pseudomonas pyocyanea*. The presence of *Staphylococcus aureus* in the wound was almost as effective as the 2 sulfonamides in reducing the gram negative population nor was there any evidence that daily application of penicillin increased their number when they were the only organisms present. The majority of the remaining agents did not produce results consistent enough for them to be considered with the agents already discussed.

It was emphasized that reduction of infection was only obtained by cleansing of the wound in addition to the daily applications and by constant attention to the guiding principle that to produce the desired effect full access to the infected part must be obtained. Neither operation nor enclosure in plaster of Paris had any pronounced effect on the infection.

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LEROY J. KLEINBAUMER, M.D.

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diphosgene which had been considered to be equivalent to that caused by oxygen consists in a lesion of the alveoli.

4 Exposure to oxygen aggravated the condition of animals with blast injuries of the lung

In interpreting the symptoms produced by exposure to oxygen in man the author concludes that substernal distress is a manifestation of an injurious effect of the oxygen on the pulmonary tissue and the decrease of vital capacity is due partly to the dilating effect of the oxygen on the pulmonary vessels and partly to an exudation into the pulmonary tissue caused by oxygen at high partial pressure

Attention is drawn to the disturbance of the carbon dioxide carrying capacity of the venous blood that results when a normal subject inhales pure oxygen. It is suggested that the pulmonary damage in oxygen poisoning is caused by a disturbance of the carbon dioxide transport in the venous blood. The author's view of the pathogenesis of pulmonary damage may be formulated as follows. The oxygen entails an injurious effect on the lungs when the supply and demand exceeds the demand.

The bearing of such views on oxygen therapy is discussed. Long continued treatment of arterial anoxia with high concentrations of oxygen can safely proceed provided that the administration is adjusted to avoid a supersaturation with oxygen in the venous blood. The value of the increase of volume of circulating blood that is believed to occur during the first hour of oxygen inhalation is discussed in connection with shock. Attention is also drawn to the im-

portance of the dilating effect of the oxygen on the pulmonary vessels which may aggravate hemorrhagic pulmonary damage

The author considers that the views set forth may provide a more accurate background and open up extended possibilities for clinical oxygen therapy

MARY FRANCES FOX, M.D.

Collen William G and Griffith Harold R.: Postpartum Results of Spinal Anesthesia in Obstetrics. *Current Res Anesth.* 1947 26 114.

The postpartum results of 200 consecutive cases of spinal anesthesia for vaginal delivery have been carefully studied and compared with a similar series of 200 consecutive cases of gas anesthesia with cyclopropane or nitrous oxide followed by cyclopropane

The best results are obtained if the dose of spinal anesthetic agent is small and given in dilute solution. The authors use 5 or 6 mgm. of pontocaine in either 0.10 or 0.075 per cent solution. The incidence of spontaneous respiration and optimum oxygenation of the newborn is greatly increased and uterine blood loss during labor is greatly reduced by the use of spinal anesthesia. Headache does not occur more frequently after spinal anesthesia than after gas anesthesia, but it may be somewhat more distressing

It is emphasized that the services of a qualified medical anesthetist with some clinical experience in obstetrics is essential for success in the use of this method

MARY FRANCES FOX, M.D.



Fig. 3.

Fig. 3. (Blair) Hemosiderosis, giving rise to miliary mottling.



Fig. 4.

Fig. 4. Encysted effusion in the lesser fissure and the upper part of the greater fissure, as seen in the lateral view.

The areas of increased translucency are due to (1) pneumothorax, (2) emphysema (3) single or multiple air containing cysts (4) cavities and (5) diaphragmatic hernia.

The opacities may be subdivided as follows

1 Mottled opacities which may be localized to an area of lung or may be generalized throughout the lung. The former occur in phthisis although this form of tuberculosis is rather rare in children and in patchy pneumonitis. The latter is encountered in acute miliary tuberculosis, chronic miliary tuberculosis, leucemia and in the rare hemosiderosis (Fig. 3).

2 Rounded opacities which may be intrapulmonary, when they are caused by (a) primary tuberculous infection (b) hydatid cyst (c) congenital cyst, (d) solitary secondary deposit, and (e) primary neoplasm and extra pulmonary when they are caused by (a) neoplasm (b) fluid-containing cyst and (c) encysted effusion.

3 Homogeneous nonrounded opacities, situated in the pleura. These opacities in children are almost always due to either clear effusion or pus in the pleural cavity. A roentgen study in both postero-anterior and lateral views is indispensable (Fig. 4). Encysted interlobar effusions are rare in children.

4 Opacities of segmental origin. These the most common type of opacities in children are undoubtedly the result of a mixture of consolidation and collapse of the lung. They are seen in (a) inflammatory conditions such as a true lobar pneumonia atypical pneumonia, and the very common nonspecific pneumonitis (b) pressure of a tuberculous gland on the bronchus or ulceration of the gland into the bronchus, (c) inhaled foreign body and (d) primary neoplasm.

5 Linear opacities. Abnormal linear opacities encountered in the lungs are caused by accessory fissures such as the one associated with the lobe of the azygos vein by fibrosis by complete collapse of a small segment of lung or by bronchiectasis.

T. LEONETTI, M.D.

Jamison H. W., and Carter R. A.: *The Roentgen Findings in Early Coccidioidomycosis* *Radiology* 1947 48 323

A detailed roentgen characterization of early coccidioidomycosis has been accomplished largely because military necessity required the stationing of troops in certain endemic areas. Because the Medical Corps was aware of this hazard thorough case studies, including laboratory and x-ray findings were made.

The diagnosis in endemic areas is not difficult the sporadic cases require an alertness on the part of the clinician to its possibility. It has been established that riding through an endemic area (the San Joaquin Valley of California, Arizona, and parts of Nevada, New Mexico and Western Texas) may be followed by infection hence such a diagnosis should be considered in any patient having a respiratory infection and giving a history of being in or through such an area. An intradermal test with the use of a 1 to 100 concentration of a potent extract will be positive in all but a few of the more severe disseminated infections. This presumptive diagnosis is established by positive precipitation or complement fixation tests, though final proof is obtained by demonstration of the organism from sputum culture or guinea pig inoculations.

Clinically influenza and primary atypical pneumonia present somewhat similar symptoms and find

ings including local or general aching, weakness, sore throat, indefinite gastrointestinal disturbance, cough, a temperature of from 100 to 102 degrees, a white blood count of 10,000 to 12,000 with a mild increase in neutrophils. However, in early coccidioidomycosis there is frequently an eosinophilia and chest pain is present in a high percentage of the patients.

The fibrile reaction is usually over in from 3 to 10 days though a chest roentgenogram may still show a considerable residual infiltration. One to 2 weeks later from 2 to 20 per cent of the patients develop skin lesions, some characteristic of erythema nodosum, others *erythema multiforme*. Acute arthritis and conjunctivitis may accompany these allergic skin manifestations.

The roentgen findings in acute primary coccidioidomycosis are not specific. The lesions are quite similar to bronchopneumonia, primary atypical pneumonia, rheumatic pneumonitis or tuberculosis. A roentgenogram of the chest made at the time of onset will show some pulmonary infiltration in about 90 per cent of the cases. The degree of infiltration varies from slight haziness of the hilar shadows to extensive consolidation of a major portion of a lung field. The infiltrations vary in density, are mostly unilateral, homogeneous, usually hilar or basal in location and show little tendency to lobar distribution.

If the infection persists, the symptoms (low grade fever, weakness, irritability, chronic cough, chest pain, weight loss, and sometimes hemoptysis) may closely resemble those of tuberculosis. The roentgenogram may be misleading if the lesion is in the upper lung fields, especially since cavitation also occurs in coccidioidomycosis. The differentiation is dependent on the bacteriological and immunological findings. Although 85 to 90 per cent of the cases clear in from 2 to 6 weeks, some have persisted for over 2 years.

Other slowly resolving pulmonary lesions including histoplasmosis and torulosis must be excluded.

Mediastinal adenopathy is uncommon in the usual acute transitory infections and is almost never seen in the focalized infections of the nodular or cystic types; however, approximately one third of the cases of persistent pneumonitis and practically all fatal cases have an associated mediastinal adenopathy.

Pleural effusion is frequently present. It is ordinarily small in amount, and fleeting, but it may be massive and persistent.

Residual coccidioidal foci may persist in the lungs as single or multiple nodules 1 to 4 cm. in diameter, and sharply circumscribed, or as isolated thin walled ringlike cavities 1 to 3 cm. in diameter. The latter are sometimes mistaken for congenital cysts. Cases resulting in nodule formation are usually no more severe or prolonged than those in which the infiltration clears completely, the exception being those presenting multiple areas of infiltration followed by multiple nodule formation. In these cases the onset is typically quite severe. By contrast, those cases in which cavities develop present typically more severe initial symptoms. Cavitation may develop from the

area of the pneumonitis or from the excavation of nodules. In the latter case the cavities are usually smaller and have thicker walls. Cavitation and/or nodule formation may occur in from 3 weeks to 3 months after the initial pneumonitis. The nodules and cavities are benign in character and are uniformly slow in evolution, some lasting as long as 2 years, with no appreciable change in size. Some of the nodules eventually calcify. These residual foci are usually found on routine examinations. The roentgenograms are in marked contrast to the clinical and laboratory findings, which are normal. In the presence of cavitation, however, the organism is usually recovered from the sputum with no difficulty. Most coccidioidal cavities are easily identified in endemic areas. The typical finding is a solitary thin walled ringlike shadow without surrounding infiltration. In a few cases, however, the condition cannot be differentiated from tuberculosis; in other cases it resembles a pyogenic infection.

The roentgen findings in disseminated coccidioidal infections are primarily those of mediastinal adenopathy, associated with varying degrees of pulmonary infiltration. Massive confluent pulmonary disease may be present with multiple areas of bone destruction. The chronic form of the disseminated type of the condition may have draining sinuses or chronic coccidioidal osteomyelitis.

R. B. Lewis, M.D.

Wellin, S.: The X-Ray Diagnosis of Cholesteatoma in the Temporal Bone. *Brit. J. Radiol.* 1947 20 192.

As a rule, cholesteatoma cannot be diagnosed roentgenologically until bone destruction has set in. Therefore a detailed anatomical picture of the temporal bone obtained in several projections is essential.

The author uses the four projections of Runstrom together with the projection of Towne which permits a simultaneous viewing of both sides.

In the projection of Towne the roentgenogram is made with the patient lying on his back, the chin a little drawn in, and the central ray tilted 33 degrees toward the feet.

In the four projections of Runstrom the following procedure is applied:

In the first and second projections the patient is lying on his side and stereoscopic roentgenograms are made with the central ray tilted 25 and 35 degrees, respectively, toward the feet. In the third projection, which is a modification of the original Siemens projection, the patient likewise lies on his side but the central ray is tilted from behind forward at an angle of 30 degrees and from 5 to 10 degrees cranially. The fourth projection is the well known standard submentovertical projection.

The author describes in detail the roentgen appearance of the various structures of the temporal bone in all these projections, and uses photographs of anatomic specimens and typical roentgenograms for the purpose of illustration.

The roentgen diagnosis of cholesteatoma was originally considered easy but experience shows that

many great difficulties are involved especially when the cholesteatoma is located in pneumatized bone structures.

One may consider the following findings as rather characteristic the sharp definition angularity and polygonal shape of the cholesteatoma cavities their occurrence in temporal bones with reduced pneumatization and the presence of a linear calcareous zone between the cholesteatoma and the surrounding bone tissue. The author found that there are some other roentgen findings which may also be used advantageously. These vary according to the site of the cholesteatoma in the external auditory canal attic, aditus eustachian tube, or antrum.

A cholesteatoma of the external auditory canal is rarely subjected to roentgen examination unless an extension into the tympanic cavity is suspected. An enlargement of the external auditory canal as compared to the opposite side and superficial destruction of the walls are occasionally noted.

The cholesteatoma of the attic may lead to 3 different pictures at times there is a destruction of the lateral wall at other times the destruction is localized in the ceiling and last if the cholesteatoma grows backward toward the aditus there may be destruction of the walls of the aditus. If a cholesteatoma develops in the epitympanic recess a well defined spikelike or rounded defect is observed in the lower margin of the attic.

The cholesteatoma of the aditus is characterized mainly by an enlargement of the aditus. Later this is followed by destruction of the walls and extension into the antrum cavity. In practically half of the author's cases a diagnosis of cholesteatoma was made on the basis of changes in the aditus alone.

In cholesteatoma of the eustachian tube a typical finding is a pathologic dilatation of the tube with sharp outlines.

A cholesteatoma in the antrum is diagnosed with some difficulty since the size of a normal antrum varies to a great extent. The problem is further complicated if the temporal bone is pneumatized. The projection of Towne (or the almost identical projection of Holmes) helps here considerably because it permits a comparative study of the two sides. If the cholesteatoma cavity is small, diagnosis is impossible provided there is not also a pathological enlargement of the aditus. If the destructive zone is large a differentiation from abscess cavity must be considered. A sharp circumscribed margin of the cavity with associated changes in a sclerotic temporal bone is indicative of cholesteatoma. T. LUCOMA, M.D.

List Carl F. and Hodges, Fred J.: Differential Diagnosis of Intracranial Neoplasms by Cerebral Angiography *Radiology* 1947 48 493.

Due to differences in vascularization of intracranial tumors angiography not only permits a localization of most tumors but also furnishes information as to the nature of the neoplasm by demonstrating a specific vascular pattern. In this respect the method is decidedly superior to ventriculography.

Egas Moolz and his pupils were the first to describe characteristic angiographic findings in angiomas meningiomas, and certain vascular gliomas whereas in cysts abscesses, and cholesteatomas they noted a conspicuous absence of the blood vessels. Later similar observations were made by other investigators.

The authors in a series of 125 cases at the University of Michigan Hospital found a typical vascular pattern in the following groups: angioma, meningioma, glioblastoma and certain types of astrocytoma. It must be mentioned, however, that a negative report does not necessarily permit an exclusion of these lesions, but a positive report is almost pathognomonic.

Angioma (8 cases) Most of the lesions in this group are arteriovenous malformations. The angiograms as a rule show one or several enlarged and unusually tortuous arteries leading to a tangle of smaller vessels from which one or more greatly dilated and redundant veins emerge. Because of the numerous arteriovenous connections the entire vascular malformation is visualized during the arterial phase of the angiography and there is no filling during the venous phase. Other characteristic signs are that vascular malformations, in contrast to true neoplasms, do not displace the uninvolved cerebral vessels and that angiomatous vessels are far more bizarre in size than those encountered in vascular neoplasms. Cavernous angiomas of the brain without associated vascular malformation are rare and their angiographic appearance is inconclusive. The authors did not have a chance to observe an intracranial angioblastoma which occurs almost exclusively in the cerebellum.

Meningioma (20 cases) The angiographic pattern of the meningiomas depends somewhat on the location of the tumor. As a whole since most meningiomas are demarcated and globular, they cause a characteristic type of vascular displacement. The cortical arteries in contact with the tumor appear to be distended and separated from one another where as the arteries of the adjacent compressed brain are crowded together and form a concentrically arranged corona around the lesion. In frontoparietal meningiomas this is best demonstrated in anteroposterior arteriograms whereas in meningiomas of the olfactory groove the appearance is visualized to greater advantage on the lateral arteriogram. Since the meningiomas obtain their blood supply from both the external and internal carotid (and vertebral) systems a combination of angiography of the external (or common) carotid artery and of the internal carotid artery is of definite value. The external carotid artery provides the extracranial and dural circulation of the meningiomas. The supplying arteries are apt to be enlarged and tortuous they end in a dendritic cluster of smaller vessels which often perforate the bone leading to negative imprints in the calvarium on the simple roentgenograms and to a nerve end like arborization on the arteriogram. The internal carotid (and less frequently the vertebral) artery supplies the intracranial circulation of the meningioma. Besides the normal but displaced cortical

cal arteries, one may observe one or multiple newly formed "tumor vessels" which split up into finer branches giving on the arteriograms a paint brush or flower spray appearance. The venogram shows large but short veins with many tributaries along the circumference of the tumor in a garland or claw like fashion. Not infrequently due to the very rich capillary vascularization of the meningioma, a rather diffuse opacification silhouetting part of the growth or even the entire growth is observed.

Glioblastoma (55 cases) According to various investigators glioblastoma leads to a typical angiographic appearance in 40 to 64 per cent of the cases when the peculiar vascular pattern is directly pathognomonic. Hardman distinguishes four different zones of blood vessel structures in glioblastoma which: (1) an infiltrating tumor often undergoing extensive central necrosis. There are (1) the zone including the brain tissue adjacent to the neoplasm in which the vascular pattern is normal, although some what dilated (2) the invading zone showing glomeruloid microaneurysmal disruption of the angioarchitecture, (3) the deeper still viable zone containing sinuoid vessels larger in size but fewer in number and (4) the central necrotic or cystic zone in which are blood vessels which are thrombosed and hyalinized. The angiographic changes are observed in the second and third zones. The authors describe two types of special vascular pattern. In the first type the network of the fine crisscrossing capillaries and of the few larger sinuoid vessels resembles the roentgenographic picture of a normal lung, although it is more irregular and spotty. The second type is characterized by a very coarse and bizarre appearance of the blood vessels similar to that seen in the arteriovenous malformations, but no well defined afferent arteries and efferent veins can be distinguished and there is always displacement of the adjacent normal vessels of the bulk of the tumor.

Astrocytoma (15 cases) Since astrocytoma has a tendency to interstitial liquefaction and formation of cysts the blood supply is relatively scanty and therefore it is not demonstrated too well by either histologic or angiographic methods. In addition there is extensive stretching and spreading of the larger and medium-sized cerebral arteries.

The conclusion is reached that in the four groups of tumors described a preoperative study of the vascularity of the lesion is of great aid not only for establishing surgical indications but also for planning the operative attack. T. LECHE, M.D.

Gardini, G.: X Ray Therapy of Operable Cancer of the Vocal Cords. Eighteen cases Treated in the Period from 1921 to 1940 (La rontea-terapia del carcinoma della corda vocale operabile. Su 8 casi trattati dal 1921 al 1940) Radiol. med., Milan 1947 33 25.

Surgical removal is the accepted method of treatment of endolaryngeal tumors, x ray therapy being used only for inoperable tumors, postoperative recurrences, or meta taxes in the lymph glands.

Cancer of the vocal cords appears in the form of pedunculated tumors, leucoplakia, or ulcers, and may spread toward the anterior or posterior commissure.

Carcinoma of the vocal cords is considered a radio-sensitive tumor, and Coutard suggested various methods of treating it. From 6,000 to 7,000 centners roentgens may be applied within 6, from 15 to 16 or 50 days in the form of daily treatments. In order to avoid epidermitis it is generally advisable to reduce the daily dose and to prolong the duration of the entire treatment. The author uses the following technique: 180 kv., 1 mm. of copper as filter 10 ma., from 50 to 60 cm. focal distance 200 roentgens daily alternation of the port of entry and the use of only 4 irradiation fields. The entire skin dose ranges from 6,000 to 8,000 roentgens and is given within 6 weeks.

The author reports 18 cases in which operable cancer of the vocal cords was treated with x rays with good results. Twelve patients were alive 5 years after treatment. JOSEPH K. NAKAT, M.D.

Garland, L. H.: Pulmonary Sarcoidosis: The Early Roentgen Findings. Radiology 1947 45 333.

The pulmonary manifestations of sarcoid include lymph node enlargement, miliary or nodular lung densities, or a combination of nodal enlargement and pulmonary infiltration. The disease is insidious in onset and tends to run a chronic relapsing course. Usually the constitutional symptoms are mild, though occasionally severe even fatal cases occur.

The author has summarized the literature in respect to the histological changes and the pulmonary findings. He present 36 cases of sarcoidosis 33 of which were verified by histological examination. Several were discovered incidentally in routine roentgenogram of the chest. Approximately one half of the patients were in their twenties, the others ranged from 11 to 74 years of age. Twenty two were females 14 were males 21 were white 15 were colored. Ten patients had only pulmonary lesion. The pattern of lung involvement was extremely variable ranging from true miliary densities, through coarse nodulations and apparent linear fibrosis, to coalescent fibrotic or pneumonic shadows. There is nothing characteristic in the findings in the individual cases. The miliary or nodular lesions are due to aggregations of sarcoids in the lung parenchyma. The linear lesions may be due to sarcoid lymphangitis, to lymphedema, to congestion or occasionally to fibrotic changes.

Combined pulmonary lesions and lymphadenopathy were present in 23 cases. Hilal or mediastinal lymphadenopathy or both without pulmonary involvement was present in 11 cases. In the latter group 6 patients showed bilateral hilal, plus right paratracheal adenopathy 3 showed hilal adenopathy alone 1 paratracheal adenopathy alone and 1 hilal plus left paratracheal adenopathy. Of 3 patients without chest findings, 1 died in a short time of generalized sarcoidosis and the other developed hilal adenopathy after a 3 weeks period of observation.

The lymph node enlargement seemed to follow a rather set pattern in approximately 62 per cent of the patients in these last two groups (13 of 21). This pattern has not previously been described and consists of bilateral fairly symmetrical hilar enlargement combined with right paratracheal enlargement. The combination is called the sarcoid type of adenopathy.

The nature of the "primary" or "first re-infection type" sarcoid lesion in the lung has not been established. Some have stated that the early pulmonary lesion is a diffuse millary one however in 2 definite and 12 probable early cases the author found the following distribution: disseminated millary lesions 1; nodular lesions (diffuse or localized) 3; nodular or linear parenchymal densities with adenopathy 6; adenopathy alone 4. The impression is that there is more chance of the primary pulmonary manifestation of sarcoidosis being one of combined parenchymal densities plus lymphadenopathy than there is of its being purely a millary parenchymal process.

The diagnosis of sarcoidosis remains largely a histological procedure though certain roentgen findings, combined with clinical information, are very suggestive. These are mentioned in the following order of frequency: (1) bilateral hilar and right paratracheal adenopathy with or without associated pulmonary infiltration or nodular densities; (2) widely disseminated pulmonary millary or nodular densities without calcification in a person clinically well; (3) massive enlarged hilar nodes (potato nodes) in an apparently well person. The presence of associated lesions in the peripheral nodes, skin and uveal tract is quite helpful in the diagnosis. Classical cystic changes in the bones usually occur in about 10 per cent of the cases, and an additional 10 per cent show coarse trabeculae with cortical thinning due to infiltration of the marrow with hard tubercles and fibrous tissue. Short case histories are included.

R. B. LEWIS, M.D.

Sosman, Merrill C.: Venous Catheterization of the Heart. I. Indications, Techniques, and Errors. *Radiology* 1947 45 441.

Catheterization of the right heart is most useful in the study of hemodynamics, both in establishing the normals for physiological variations and the changes in varied forms of heart failure, cardiopulmonary disease and shock. It is valuable also in helping to establish the diagnosis more accurately in congenital heart disease. In addition the method has been used in the study of cerebral renal and hepatic physiology in health and disease by the collection of samples of blood from the jugular renal or hepatic veins as desired.

The technique of performing venous catheterization of the heart has already been published. At present a single lumen catheter size 9 French made of woven silk, and radiopaque with the orifice at the tip is used. It is from 100 to 125 cm. in length flexible, and yet stiff enough so that it can be rotated by twisting the exposed end without buckling. It should

have a slight curve or bend near the tip. Under strict aseptic precautions and novocaine anesthesia an incision is made through the skin over the median basilic vein in either the right or left antecubital space. The catheter is then threaded into the vein advanced under fluoroscopic guidance and aimed at the desired area by pushing and twisting the proximal end. The catheter is thus passed upward into the axillary vein, the superior vena cava, and into the right auricle. From here the catheter is manipulated into the right ventricle. From the right ventricle the catheter may be introduced through the pulmonary valve into the right or left pulmonary artery as desired. In patients with congenital heart disease 2 or 3 samples of blood are withdrawn through the catheter from the pulmonary artery from the right ventricle, from the right auricle and from the superior vena cava, and spot films are taken of the tip of the catheter in various positions numbered to correspond to the numbered samples of blood. The samples are analyzed for their oxygen content. Blood pressure readings in the various chambers are taken.

Failure to secure adequate or reliable data from this test has been infrequent, only 13 examinations of 100 being unsatisfactory.

FRANK L. HUMET, M.D.

Holt, John F.: Epipericardial Fat Shadows in Differential Diagnosis. *Radiology* 1947 45 473.

The roentgen visualization of fat deposits along the left border of the heart at times completely obliterating the cardiophrenic angle in adipose persons is not uncommon. There are a few articles in the literature pointing to the fact that similar roentgen shadows may be present along the right border of the heart.

The author, after reviewing 56,000 routine admission 35 mm. photofluorograms made at the University Hospital of Ann Arbor, Michigan, found that the incidence of right median base shadows constituted 0.6 per cent of the total. From this group he selected 14 cases which he briefly describes in the text, using a typical roentgenogram for illustration in 8 cases.

The shadows of epipericardial fat deposits may show considerable variation in size and shape but in general they appear roughly triangular or ovoid with the outer margin well defined and somewhat convex. Fat, as a rule, is less dense than other soft tissues but against a background of aerated lung the difference in density is lost to a considerable degree. The list of lesions from which a differentiation must be made includes mediastinal tumors, bronchogenic neoplasms, metastatic tumors, tuberculoma, eventration and other anomalies of the diaphragm, diaphragmatic tumor, paraspinal effusion following splanchicectomy, rotoscoliosis and even a large hypertrophic osteophyte.

Careful examination by several methods is necessary. Frontal and lateral roentgenograms of regulation size should always be made and supplemented if necessary by fluoroscopy and roentgenograms in

oblique projections. In the lateral view the fat pad is invariably located at the anterior costophrenic sulcus, and the extremities of its smoothly marginated, bow-shaped posterior border appear to fuse gently with the anterior chest wall. Bronchoscopy and bronchography may be useful at times. If herniation of the diaphragm is suspected a complete examination of the gastrointestinal tract including a barium enema, should be made.

If the diagnosis remains inconclusive periodical checkup roentgenograms are advisable

T LECHEA M.D.

Glenn, John C., Jr., and Baylin, George S.: *The Roentgen Findings in Acute Pancreatitis. Am J Roentg* 194 57 604.

Acute pancreatitis is by no means rare yet the clinical diagnosis is made rather infrequently.

A review of the literature shows that the condition occurs preponderantly in males (70 per cent) compared to 50 per cent in females) between the ages of 20 to 60 years and that it is encountered mostly in the obese heavy eaters and drinkers.

The most important etiologic factors are summarized as follows:

1. *Infectious origin.* (a) Through the lymphatics (b) through the blood stream (c) through the pancreatic or bile ducts (d) by direct extension from the kidney gall bladder etc. (e) activation of bacteria and toxins in normal glands (f) as a complication in mumps typhoid scarlet fever diphtheria and other diseases.

2. *Noninfectious origin.* (a) Reflux into the pancreatic ducts of (1) bile due to stone in the ampulla of Vater, spasm of sphincter of Oddi, edema of the ampulla of Vater or diverticulum of the duodenum (2) duodenal contents (b) erosion of peptic ulcer (c) obstruction of pancreatic ducts due to (1) epithelial metaplasia of duct epithelium (2) tumors, worms, calculi (d) trauma (e) surgical, (1) anesthesia, (2) accident (e) vascular accidents (1) embolus, (2) thrombosis (3) cardiac decompensation with vascular congestion (f) autolysis of pancreas.

3. *Chemical* (a) Arsenic, and (b) alcohol

4. *Combination of factors*

The most common etiologic factors are biliary tract diseases and alcohol. Werner and Tennant found that in 51 individuals dying during acute alcoholic episodes, 25 showed acute pancreatic and 8 showed chronic pancreatic lesions. It has been shown that the injection of almost any material into the pancreatic ducts is capable of producing pancreatitis.

Acute pancreatitis is characterized by a sudden onset of epigastric pain which is so severe that Movnithan calls it a "formidable cata trophe, by nausea, vomiting distention and signs of collapse. However these findings are also observed in biliary tract disease perforated viscus, and intestinal obstruction, a fact which often makes differential diagnosis very difficult. The most valuable sign

pointing to acute pancreatitis is the sudden onset of severe pain commonly after a hearty meal or a drinking bout.

The most frequent laboratory findings are those resulting from the effects of dehydration. In some of the patients a high fasting blood sugar level is found. The serum amylase and lipase, and the urinary diastase determinations are, according to Whipple, Skoog, Polowe and other investigators, of certain diagnostic aid.

The authors also give a detailed description of the anatomy of the normal pancreas and discuss at length the pathology of acute pancreatitis.

The roentgen findings in acute pancreatitis are characterized by regional abnormalities induced because of the strategic anatomic relationships of the pancreas. Case and more recently Metheny, Roberts and Stranahan reported a number of roentgen changes associated with pancreatitis. The authors agree with most of the changes but they think that the stress placed on the atony of the duodenum is exaggerated. True they have found in some cases an atonic bulb filled with gas but more often there was a rather peristaltic spasm of the duodenal loop associated in some with contour changes and in others with no such changes. The authors also believe that some alteration occurs in the mucosal relief and the peristaltic function of the proximal jejunum, or the part of the colon in direct contact with the pancreas giving rise to constant areas of spasm intermingled with apparent or real dilatation and a coarsening of the folds.

The authors summarize the roentgen findings in acute pancreatitis as follows: If the head of the pancreas is enlarged the duodenal loop is widened the valvulae conniventes are flattened the inverted

"J" loop of Frothingham may be present and there may be a spasm of the duodenal loop. In addition there may be a pressure defect or a spastic area of the transverse colon and some of the small intestine may show alternate areas of spasm and dilatation. The foramen of Winslow may become sealed off, leading to a collection of fluid in the lesser omental sac with displacement of the stomach. An obstruction of the common duct may lead to enlargement of the gall bladder and liver. The neck of the pancreas is in close proximity to the bulb and pylorus and its involvement would produce distortion and displacement of these organs. The body of the pancreas is in relationship with the stomach duodenojejunal flexure, small intestine left flexure of the colon, pillars of the diaphragm, left kidney and aorta, and other blood vessels. A pressure defect on all of these organs may lead to manifold changes. Rather important findings are the fluid at the left base due to the diaphragmatic relationship and the obliteration of the left psoas and renal shadows secondary to edema or inflammation of the soft tissues. The tail of the pancreas contacts the diaphragm, splenic flexure of the colon and the spleen. Corresponding changes may occur in these organs.

It should be remembered that a duodenal diverticulum, although not particularly alarming when buried within the pancreatic substance and inflamed, may lead to pancreatic disease.

A bibliography of 34 articles is appended.

T. LEUCOTIA, M.D.

Brallisdorf, J. F.: Some Experiences with Bone Tumors. *Brit J Radiol.*, 1947 no. 129.

The author reviews 10 cases from his files to illustrate certain pitfalls in the diagnosis of tumors of bone.

Case 1. A girl age 14 was first seen in December 1944. She complained of a tender swelling over the upper left arm which followed a severe blow 7 weeks previously. A roentgenogram revealed multiple regular periosteal accretions over the anteromedial aspect of the upper third of the humeral shaft. The compact bone was broken and irregular and the cancellous tissue was blurred. The findings were considered compatible with Ewing's sarcoma, however in view of the recent trauma the author believed that the lesion was probably inflammatory. The Wassermann reaction was positive. A course of sulfathiazole and antileptic therapy was started. Films made October 1946 showed the humeral shaft restored to normal. The author believes that the Wassermann reaction should be obtained in all bone tumors since syphilitic lesions may simulate many other pathological conditions. Multiple linear periosteal accretions may be due to syphilis, tuberculosis, bone sepsis or Ewing's sarcoma.

Case 2. A girl age 6 with a painful swelling over the right upper arm was observed for several weeks and was then discharged with a diagnosis of sarcoma with multiple metastases in the lung. The roentgenograms analyzed by the author showed marked changes in the upper half of the humeral shaft (diaphysis only) which had fractured. The disintegration of the bone and the periosteal reaction was indistinguishable from osteomyelitis but there were multiple rounded secondary lesions in the lungs which were very suggestive of sarcoma. In view of the hopelessness of any operative procedure the patient was treated with sulfathiazole in the hope that the lesion was inflammatory. The lesions progressed for 2 or 3 months then started to improve. By the end of 6 months the patient was entirely well clinically and the roentgenograms were normal. Although the diagnosis in this case was never established, the complete cure of an apparently hopeless case is remarkable.

Case 3. A young man, age 25, returned from India with the complaint of a lump in the lower left thigh. Radiographs showed an ill defined destruction of the superficial and medullary outlines of the femoral shaft at the junction of the middle and lower thirds. There were ill defined linear spicules at right angles to the cortex, arranged in a fusiform shape and some deep soft tissue swelling and multiple linear periosteal accretions along the cortex. The chest was clear. The destruction increased during the next 2 months.

X-ray therapy was given during the next 4 months. The response was excellent. Five months after therapy roentgenograms revealed a lesion of the femur which because of sharp outline appeared benign. There was no change during the next 6 months. At the end of this period there was evidence of localized extension in the shaft of the femur. Three months later there were metastatic lesions involving the fifth lumbar vertebra and pelvis. The limb was then amputated at the hip joint. The histological sections were reported as secondary carcinoma, probably of bronchial origin. The author believes that before surgery is resorted to a thorough search for possible metastases should be made particularly in areas in which the patient complains of pain.

Case 4. A boy age 14, had progressive painless enlargement of the lower half of the right thigh. The radiograph showed separation of the lower femoral epiphysis, and multiple periosteal accretions about the lower end of the shaft. There were some bone fragments and amorphous calcium deposits in the soft tissue. The clinical and radiological evidence pointed to a fracture through a sarcomatous lesion but because of paralytic deformities of both extremities, operation was postponed. The bone lesion slowly resolved finally clearing completely. This was apparently a neurotrophic lesion similar to a Charcot's joint.

Case 5. A girl, age 18 had complained of a dull pain in her left knee for 2 months, the pain being worse at night. There was no history of trauma. X ray findings showed a localized sclerosis of the medial tibial condyle which was suggestive of sarcoma. The lungs were normal. A biopsy was reported as showing cicatricial fibrous tissue and chronic inflammatory changes of the bone and synovial tissue but nothing suggestive of tumor. A roentgenogram 1 month later showed further involvement of the head of the tibia, sarcomatous in appearance. Metastatic lesions developed rapidly and the patient died. The author mentions a second case from which 3 biopsies were taken both showing only an inflammatory change, yet the patient died 2 years after the onset. In a third roentgenographically similar case the limb was amputated promptly but the patient died within a year with pulmonary metastases.

Case 6. A patient, age 20 complained of pain in the left knee joint. Physical examination and roentgenograms were negative. Months later x ray films showed a localized osteolytic lesion at the lower end of the femur which was called an osteoclastoma. A course of x ray therapy was given. Roentgenograms immediately and 1 month after therapy showed progression of the lesion, however consolidation was apparent 3 months later and was almost complete at the end of 1 year.

Case 7. A patient, age 31 complained of pain in the knee joint. Roentgenograms indicated an early osteoclastoma. X ray therapy was given but the tumor did not respond. Subsequently the leg was amputated, and the x ray diagnosis was confirmed by histological sections.

The author has observed patient with osteoclastoma who 3 year after limb amputation have developed pulmonary metastases other patients develop metastases as long as 15 years after a positive biopsy has been reported. Simple chondromas of the extremities frequently present histological appearances which are regarded as chondrosarcoma. Chondromas of the pelvis, on the other hand, usually appear simple but metastases frequently develop.

Case 8. A male age 58 complained of pain in the knee joint limitation of motion and swelling on the medial aspect of the joints. The roentgenogram revealed osteoarthritic changes in the knee joint and some cortical irregularity of the medial aspect of the upper end of the tibia over which soft tissue swelling was shown. The findings suggested sarcoma and the leg was amputated. On examination the soft tissue tumor was found to be a Baker's cyst.

Case 9. A boy age 16 complained of swelling below the knee for 2 months. There was no history of injury. The roentgenogram showed erosion of the cortex with some ill defined disintegration of the adjacent cancellous tissue. Multiple rounded opacities in the lung were interpreted as secondary sarcoma. The patient died a few weeks later. The author states it is almost inconceivable that an earlier diagnosis could have been made in this case or that prompt amputation of the leg would have appreciably affected the course.

Case 10. A male age 60, complained of pain in the region of the right shoulder. Physiotherapy did not relieve the pain. A roentgenogram revealed some arthritic changes but no other abnormalities. Because of persistence of the pain in spite of more physiotherapy a second roentgenogram was made 4 months later. This revealed almost complete disintegration of the scapula by secondary carcinoma. The latent negative period of metastatic malignancy may extend into months. Persistence of pain is an indication for periodic roentgenogram especially in patients past middle life. The author believes that the possibility of a metastatic lesion should be considered of any bone lesion occurring after the second decade and, if surgery is contemplated, a search should be made for other metastatic lesions however once a metastatic lesion has been established there is nothing to be gained by an extensive investigation to locate the primary lesion.

The diagnosis of bone tumors is dependent on the radiographic and clinical evidence. Biopsies when the above mentioned evidence is indefinite are likewise equally indefinite. Repeated observations extending over weeks or months are preferred. Since the author has never seen a cure resulting from prompt amputation of a limb showing typical roentgen evidence of osteogenic sarcoma, he believes there is nothing to be gained by undue haste and precipitate amputations.

R. B. LEWIS, M.D.

Clarf, L. H.: Keratosis of the Larynx. *J. Am. M. Ass.* 1946, 133 833

Keratosis of the larynx exists in all grades from simple diffuse hyperplasia to papillomatous masses which fill the larynx. Carcinomatous ulceration may be seen. Other terms for the condition are hyperkeratosis, leukoplakia, and pachyderma laryngis. It is usually a localized benign hyperplasia of epithelium which does not invade the inflamed submucosa. Smoking seems to be commonly associated, and vitamin A deficiency may be a contributing factor. The disease is especially important because of the occurrence in some patients of "precancerous" lesions or true carcinoma. The principal symptom is huskiness or hoarseness of the voice. Patients without evidence of cancer should be observed, smoking stopped and vitamin therapy instituted. Surgical removal of keratotic material may be required. More radical surgery is demanded by extensive keratosis or by cancer.

CUNNINGHAM H. TUNNICLIFFE, M.D.

Sprindrich, J. and Hladky R.: The Treatment of Carcinoma of the Larynx. A Comparison of the Results of Surgery and of Irradiation Therapy by the Method of Coutard. (*Účinná rakovinářská léčba. Srovnání výsledků léčby operativní a ozářovací metodou Coutardovou*) *Lék. listy* 1946, 1: 440.

In 140 cases of cancer of the larynx, treated by all forms of irradiation therapy and by surgery from 1935 to the end of 1944 in Brno, there were 49 cures (35 per cent). Surgery cured 71.4 per cent of the pa-

tients, and irradiation cured 19.3 per cent, including both operable and inoperable cases. Since 1939 when Coutard's method began to be used exclusively the percentage of cures by irradiation therapy rose to 25 per cent. However when the percentage of cures for the method of Coutard is calculated on the basis of operable cases it rises to about 80 per cent.

These experiences and a study of the literature convince the authors that irradiation therapy is of great value in the treatment of cancer of the larynx. In 1935 they treated only inoperable cases with irradiation methods, while in 1945 they treated the intralaryngeal growths by the Coutard method, reserving the cases in which the new growth had penetrated the cartilage for laryngeal fissure. It is true that intralaryngeal surgery is still used, but irradiation therapy is gaining more and more favor especially because of the better functional results. Of the irradiation methods, that of Coutard has become the treatment of choice. However the authors believe from their experience that when the tumor has passed the cartilage, it is no longer curable by irradiation methods.

An improvement in results can, in the authors' opinion, still be achieved by a closer co-operation of all the services—laryngological, surgical and irradiation, by making an early diagnosis, by more exactly placing the indications in the individual patient, and by perfecting all methods of treatment to the point where the results attained will no longer be a matter of chance, but a matter of certainty.

JOHN W. BRENNAN, M.D.

MISCELLANEOUS

CLINICAL ENTITIES—GENERAL PHYSIOLOGICAL CONDITIONS

Adair, Norman; Cooper, George, Jr.; and Patterson, William M. Familial Osseous Atrophy. *Radiology* 1947 48 509.

A condition known as familial osseous atrophy first described by Smith in 1934 is discussed. One case is presented. The patient, a white male, age 25 was first seen by the authors in 1941. The condition began about 3 years prior to examination with bilateral plantar calluses which sloughed and formed large ulcers that would heal and break down in turn with rest and ambulation.

The patient's familial history showed similar conditions in a paternal grandfather, a father and 2 paternal uncles.

Clinically the patient had cold clammy feet with swelling and tenderness of the distal two-thirds. There were draining ulcers under the inner spaces between the distal ends of the first and second metatarsals on each foot. Neurological examination showed loss of heat and cold sensations over the toes and hyperactive reflexes of both lower extremities. Pulsations of the posterior tibial and dorsalis pedis arteries were strong and full in both feet. There was moderate ungual lymphadenopathy and microscopic examination showed this to be chronic lymphadenitis.

After 4 years without treatment the ulcers were found to be larger and the feet considerably shortened.

Radiological examination at first showed necrosis of the distal 4 cm. of the right first metatarsal bone. The margin of the distal end of the remaining portion of the shaft was irregular with multiple small amorphous sequestra about the first metatarsophalangeal joint. There was no periosteal reaction. The cortex was moderately decreased in density and the surface was slightly irregular. The only loss of trabeculation was in the inferior and distal centimeter where the bone appeared amorphous. The phalanges showed moderate atrophy and decrease in circumference. After 4 years there was complete absence of the metatarsal bones except for the proximal portions which were atrophied. The distal ends of the naviculars, cuboids and cuneiforms were absent. The remaining bones of the feet were moderately atrophic. The rest of the skeleton was normal.

The x-ray appearance was not that of pyogenic infection. Smears, cultures biopsy studies and blood and spinal fluid examinations ruled out tuberculosis, fungus, leprosy and syphilis. Blood calciums were normal. The skin sensitivity to cold and heat showed no definite outline of nervous innervation.

In a group of similar cases reported by Tocantins and Reimann in 1939 both males and females were

involved. The etiology of the disease is unknown and the clinical course and radiological findings are characteristic. It progresses after onset to finally cripple the victim. No deaths have been known from this malady. W. FOSTER MONTGOMERY, M.D.

Curtis, George M. and Fertman, M. Boen: Blood Iodine Studies; The Blood Iodine in Nonthyroid Disease. *Arch. Surg.* 1947 54 541

The authors present their findings in a study of the blood iodine level of representative patients with 115 different nonthyroid diseases. They have found that these nonthyroid diseases affect the basal metabolic rate less characteristically than thyroid disease and even more seldom cause any change in the blood iodine. Those deviations of blood iodine level which were found were practically always increases and were not necessarily accompanied by an abnormal basal metabolic rate.

In 11 patients with chronic cholecystitis 9 of whom also had cholelithiasis the average blood iodine level was significantly raised approximating that found in patients with toxic goiter but without change in basal metabolic rate. The 2 patients in whom no biliary tract calculi were present had the lowest values in the group. The single patient with obstruction of the common duct had a high blood iodine, but not the highest of the group. These elevations have particular interest in the light of the role the liver is thought to play in iodine metabolism.

In a group of 14 patients with essential hypertension and hypertensive heart disease both the blood iodine level as determined by the dry ash method and the basal metabolic rate were significantly elevated. In a subsequent group of 14 other hypertensive patients in whom the blood iodine level was determined by the more recent chromium trioxide oxidation method there was no truly significant elevation. Of 16 patients said to have hypertension without cardiac disease, only 5 had elevations of the blood iodine, with slightly elevated basal metabolic rates. Among nonhypertensive cardinals there was no elevation of the blood iodine, even when congestive failure was present. Renal disease does not appear to influence blood iodine levels, at least not until some degree of renal failure has occurred. The values in patients having blood dyscrasias and degenerative diseases demonstrated individual variations but no significant deviation common to all members of a particular category. However of 5 patients with lymphatic leukemia, 2 did show a marked elevation of blood iodine accompanied by an increased basal metabolic rate.

Among the other types of diseases studied, in the nonthyroid endocrine disturbances and certain infectious diseases there were interesting but inconclusive deviations from the normal both increases and decreases. Several skin diseases, each repre-

sented by a single patient, showed significant increases. There was no particular abnormality of the blood iodine levels found in psychic disorders, myelogenous leukemia, or neoplastic diseases (both benign and malignant) of extrahepatic and extra-thyroid origin.

The article contains 4 tables elaborating the findings in all the nonthyroid diseases studied. The pertinent literature on blood iodine studies is reviewed.

BENJAMIN F. LOEBENBERG, M.D.

GENERAL BACTERIAL, PROTOZOAN AND PARASITIC INFECTIONS

Lamb, John H.; Lala, Everett S.; and Jones, Phyllis E.: Actinomycosis. *J. Am. M. Ass.* 1947 234 352

Actinomycosis may appear near any body cavity but it is most common about the mouth and there it may be primary but usually it is secondary. It is not regional and is found over the entire world.

The exact nature of the causative organism has been disputed. An aerobic actinomycete was first isolated from submaxillary lesions. Later an anaerobic pleomorphic organism, which changed from a threadlike fungus to segmented bacilli was found in carious teeth, root canals of teeth and in tonsils. It has been theorized that the fungus invades tissue previously altered by pyogenic organisms.

The 'straw chewing theory' is abandoned because there is no evidence that the organism is capable of maintaining growth on vegetable matter.

Primary cutaneous actinomycosis applies to those cases in which the infection does not spread from a neighboring mucous membrane or from a systemic infection. Diagnosis is difficult without biopsy and aerobic and anaerobic cultures.

The onset of the disease is usually insidious. There is a history of chronic periodontitis, with swelling of the soft tissues, and occasional pain. The fungus in company with bacteria migrates directly to the bone and soft tissue. After a time the person becomes hypersensitive to the actinomycetes, and actinomycosis results as an allergic manifestation to a common parasitic inhabitant of the mouth teeth and tonsils. Most of the authors' cases of acute actinomycosis have been preceded by the extraction of infected or pulpless teeth.

Diagnostic features are dark red discoloration of the skin, projection of the lesion about the surrounding skin, multiple nodules with the formation of ridges and furrows in the creases of the skin on the neck, induration, and multiple sinuses with macroscopic and microscopic granules of actinomycetes in the pus.

All the sulfonamides except sulfapyridine are recommended with sulfadiazine favored. Eight

grams are given the first day, 6 gm. daily for the next 4 days, 4 gm. daily for the next several weeks, and then 2 to 3 gm. for the following 3 months. Liver extract—10 units three times per week—is given with sulfa therapy to avoid leucopenia and agranulocytosis.

Penicillin—1,000,000 units daily for 10 day periods—has been given with success. It is recommended that three such courses be given.

Röntgen therapy with a total of 1,500 to 2,700 röntgens has been successful and is used as an adjunct to sulfadiazine.

The authors do not favor radical surgical excision in acute cases because of the recurrence in the surgical scar. Surgery may be indicated to remove sequestra after the infection has been controlled by röntgen ray therapy and drugs.

DANIEL RICE, M.D.

DUCTLESS GLANDS

Laengeron, L., Glard, P., and Nolf, V.: Cushing's Syndrome—Anatomoclinical Observation (Syndrome de Cushing. Observation anatomoclinique). *L. a. radiol.*, 1947 812

The authors had the opportunity to follow up a case of Cushing's syndrome for a period of several years and to obtain a detailed postmortem examination. Contradictory observations by recent investigators have raised considerable doubt as to the true etiology of the syndrome.

The symptoms and signs of the patient observed were divided into two phases. The first phase extended from age 20 to age 30 years and was marked by hypophyseal symptoms of amenorrhea and signs of obesity, cutaneous changes, and disturbances of the glucose metabolism. There were associated changes attributable to the parathyroid glands, chiefly generalized osteoporosis, trabecular fractures, and even vertebral collapse. The suprarenal signs were only discreet and moderate hirsutism.

The second phase of the illness extended from age 30 to death at age 33 and was characterized by the rapid development of vascular complications terminating in death from renal failure and pulmonary edema.

At autopsy no adenoma of the pituitary was found. There was an excessive number of basophilic cells and of very large cells with degenerated and hyalinized cytoplasm. There were no lesions of the suprarenal glands or ovaries. The kidneys exhibited hyalinized sclerosis of the arterioles and early interstitial sclerosis.

The authors conclude that the amenorrhea and the osteoporotic changes were of hypophyseal rather than ovarian and parathyroid origin.

EDWARD W. CARR, M.D.

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SURGERY OF THE NERVOUS SYSTEM

BRAIN AND ITS COVERINGS CRANIAL NERVES

Fabing, H. D.: Cerebral Blast Syndrome in Combat Soldiers. *Arch. Neurol. Psychiat., Chic.*, 1947 57 14.

The author presents a detailed study of 80 cases of blast injury which occurred in combat troops. The unconsciousness following such explosions was characterized by retrograde amnesia for the blast and a period of retrograde unconsciousness for a period of about one hour. This unconsciousness was usually marked by aimless dissociated behavior. The chief complaints following recovery of consciousness were diffuse anxiety symptoms and a nonspecific head ache. There were no constant physical or neurological abnormalities. Spinal fluid studies failed to reveal any deviations from the normal except in a few patients (2.5 per cent) in whom intrathecal bleeding had occurred.

Various types of therapy were attempted. Memory during the unconscious period was found to be intact under chemical hypnosis. It was noted that if a conscious recall of this material could be accomplished, the blast injury symptoms were ameliorated or entirely removed. This was best done by the use of intravenous sodium pentothal in developing and exploring the amnesic experiences. The patient was then suddenly awakened by the intravenous injection of coramine, and the amnesic details were discussed. This method proved of definite therapeutic value in 90 per cent of the patients.

Several detailed case reports are given as well as a general discussion of the literature pertinent to blast injury.

C. FREDERICK KITTLE, M.D.

Mitta, W. R.: War Wounds of the Ventricles of the Brain. *Am. J. Surg.* 1947 73 3

This report deals with penetrating wounds of the cerebral ventricular system as seen and treated in an evacuation hospital. In this hospital which received 10,455 casualties there were 108 penetrating wounds of the brain and 16 of these involved the ventricles. Of the latter group 3 led to death with out any surgical procedure. 13 underwent surgery.

The 3 patients who died without surgical treatment presented deep coma, rapid stertorous respiration, rapid pulse, wide pulse pressure and unilateral pupillary dilatation. Decerebrate extensor spasm was present in 2 cases and flaccid in 1 case. There were large intraventricular hematomas in 2 cases.

Of the group of 13 patients who lived long enough to undergo surgery all were unconscious immediately and remained so for from 30 minutes to 5 days. Nine showed a moderately widened pulse pressure. Bradycardia was present in only 2, both of whom had large intraventricular hematomas, a wide pulse pressure, and a tight brain. Localizing neurological signs were of no aid in diagnosing involvement of

the ventricles. Only in 1 case was there sufficient cerebrospinal fluid loss to implicate the ventricles. In 6 cases it was possible to diagnose penetration of the ventricles by the x ray findings and location of the wounds.

The operations were done under local anesthesia, in some cases supplemented with pentothal. All patients received morphine preoperatively. At operation there was a large variety of findings. No ventricles contained metallic foreign bodies but some contained bone fragments. There was extensive damage to gray and white matter and in 1 case the corpus callosum was damaged. Damaged tissue and foreign material were removed along the course of the projectile. Irrigation was kept to a minimum so that blood clots and foreign matter would not be washed into inaccessible regions of the ventricles. Complete hemostasis was obtained. Living fascial or penosteal grafts were used in the closure of most of the cases. Just prior to closure of the dura, some form of bacteriostatic agent was used locally—either penicillin or sulfanilamide. Some patients were given sulfadiazine and penicillin systemically and some received penicillin intrathecally.

There were 2 deaths among the 13 patients, a mortality of 15.4 per cent. The mortality in brain wounds when the ventricles were spared was 6.7 per cent. Intracranial infection was not a factor in any of the deaths.

DANIEL RUGE, M.D.

Wertheimer, P. and Barrié, J.: Cranioplasty with Free Osteoperiosteal Grafts. Observation of 11 Cases (*La cranioplastie par greffons ostéo-périostaux libres, à propos de 11 observations*). *J. chir. Par.* 1946 63 481.

Interest in cranioplasty for the repair of large cranial defects always increases during the time of war. Such was the case during the first World War as well as again after the recent war but between these two periods interest in cranioplasty lagged. The authors have not had the advantage of using tantalum but they are well aware of its wide and successful use in the hands of American neurological surgeons during the last war and in the months succeeding it.

They have found a simple method of autogenous bone grafting to be useful. Although it is not a new procedure either in France or America, it seems to be an entirely feasible and effective form of closing certain types of cranial defects. They used it in 11 cases. They turn down a generous scalp flap about the cranial defect, making sure that the flap has a wide and well vascularized pedicle. Ample normal bone and periosteum about the defect are exposed. The underlying brain and dura mater may then be inspected, and the dura mater freed from the edges of the bone defect, may be repaired with a fascial graft if that is necessary. With a chisel small mosaics of bone are removed from the outer table of the surrounding nor-

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INTERNATIONAL ABSTRACTS OF SURGERY

- [illegible]

mal calvarium. These pieces of bone are placed free upon the exposed dura mater but they do not necessarily cover the dura completely. The scalp flap is then carefully replaced and sutured in two layers without drainage.

The authors feel that in 9 of their 11 patients they have had definite success. They believe they have seen such complaints as headache, vertigo and mental changes improve and disappear after cranioplasty. Follow-up roentgenological studies of the repaired defects show that the grafts melt away into a general sheetlike mass of ossification. Their method of cranioplasty is obviously a less expensive one than that which requires the use of tantalum or silver plates.

JOMY MANN, M.D.

Estrella, J: Surgical Treatment of Facial Paralysis by Resection of Upper Cervical Sympathetic Ganglion. (Tratamiento quirúrgico de la parálisis facial y resección del ganglio cervical superior del simpático) *Rev. esp. cir.* 1945 1: 143.

For cosmetic reasons facial paralysis may demand a corrective operation especially in young women. Imperfect protection of the eyeball caused by lagophthalmos may also require an operation. Only in facial paralysis of the peripheral type is an operation justified. It goes without saying that only permanent changes form an indication for operation because in many instances the paralysis recedes in the course of time. Therefore, tests with the faradic current and an examination of the patient under anesthesia are imperative. Absence of response to the electric current indicates an irreparable anatomic interruption of the nerve. Absence of response to a galvanic current indicates definite muscular degeneration and contraindicates surgical treatment because the muscles have lost their contractility.

Three groups of operations are at the disposal of the surgeon: (1) restoration of the continuity of the nerve trunk by decompression or direct suture of the nerve, (2) re-establishment of the lost motor function by utilization of the activity of intact muscles by myoplastic procedures or neuroanastomosis, and (3) resection of the upper cervical ganglion of the sympathetic system. The first two groups of operations have a limited field of usefulness and their results are not infrequently disappointing.

The technique of resection of the upper cervical ganglion is much simpler than that of resection of the stellar ganglion. The author uses the retrorastoid approach. The ganglion is easily accessible upon the prevertebral aponeurosis at the level of the transverse apophysis of the second or third cervical vertebra. The retrorastoid route is preferred to the pre-mastoid approach by the author because the scar is less visible and because, contrary to the prevailing opinion, the exposure of the ganglion is better. The skin through the skin is made along the upper 2-thirds of the posterior border of the sternocleidomastoid muscle.

In a 54 year old woman who developed a facial paralysis of the peripheral type following a skull frac-

ture, the lagophthalmos disappeared completely following the operation and the facial muscles recuperated. The correction of lagophthalmos may be attributed to the postoperative contracture of Horner's muscle. The effect on the facial muscles may be ascribed to vasomotor and trophic modifications caused by the sympathectomy. In addition to it, compensatory kinetic mechanism may play a role.

The author concludes that a resection of the upper cervical ganglion is indicated whenever facial paralysis is permanent and a direct suture or plastic restoration of the nerve cannot be considered because the lesion is intracranial, or because the entire extracranial portion of the facial nerve is destroyed. In selected cases sympathectomy may be employed also, as a preliminary or supplemental operation.

JOSEPH K. NARAY, M.D.

SPINAL CORD AND ITS COVERINGS

Braxator, M. A. B., Watkins, A. L., and Michelsen, J. J: Electromyography in the Differential Diagnosis of Ruptured Cervical Disc. *Arch. New Psychol., Chic.*, 1946, 56: 651.

The electromyograph has been used as an instrument to detect fasciculations of muscles so fine that they are not visible to the eye. Electromyography for the detection of such fasciculations in muscles, due to lesions of the spinal cord and peripheral nerves, has been used for some time.

In the present report, 10 cases of suspected compression of the nerve roots by protruding intervertebral discs have been reviewed in the light of their electromyographic findings.

Surface electrodes were used and numerous shifts were made to find the optimum site for recording the impulses. Multiple spontaneous discharges, presenting clear cut diphasic spikes, were observed in certain muscles and not in others. The muscles showing such abnormality were then classified with regard to their nerve root innervation. By such means the suspected nerve roots were identified as having abnormal reactions.

These studies were conducted in 10 cases, and, of these 9 were operated upon. In 3 cases with suspected ruptured cervical discs, a normal electromyogram was found, and at operation no lesion was observed. In other instances, an accurate root localization was obtained by the electromyographic readings and confirmed at operation.

A differential point between recordings of impulses from muscles in cases of root compression and those in cases in which there is a degenerative process of the anterior horn cells such as progressive muscular atrophy is also discussed.

HOWARD A. BROWN, M.D.

Nilsen, J. A.: Spinal Washouts in Purulent Meningitis. *Br. M. J.*, 1947 76.

Eight cases of purulent meningitis of varying etiology are presented, in which repeated spinal washouts were performed by the single needle method of

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SURGERY OF THE NERVOUS SYSTEM

spinal lavage. The spinal washouts were done with the idea of preventing or combating the arachnoiditis and the formation of plastic crusts which are natural sequelae of the meningitis.

A one-needle technique is described in which a lavage apparatus consisting of a vacuolator of Hartman's solution is connected by a rubber tube with a clamp to a 20 c.c. syringe barrel which in turn is connected to the lumbar puncture needle. Irrigations are performed with amounts of 20 c.c. until the returning fluid is clear. Following the irrigation penicillin is instilled intrathecally in therapeutic doses. The effectiveness of the spinal washout is demonstrated by cell counts on the spinal fluid that is removed. The author has worked out what he calls a cerebrospinal fluid cellular clearance showing that the washouts resulted in a lowering of the cell counts of the cerebrospinal fluid and also decreased the cerebrospinal fluid pressure. As many as 6 or 7 washouts were done daily in some cases.

Untoward reactions such as herniation of the cerebellar tonsils from increased intracranial pressure are discussed and the author believes that the danger of herniation in uncomplicated meningitis has been unduly exaggerated. Headache was observed by warming the irrigating fluid to body temperature.

In 2 of the 5 cases reported the patient died of the meningitis, another died of other causes. In the 3 cases in which the patient recovered, no mention is made of any sequelae. The author concludes by stating. Apart from clearing pus and organisms and restoring osmosis to normal the irrigating fluid may break up communicating adhesions, and the cerebrospinal fluid pressure is kept down.

HOWARD H. LAMSTER, M.D.

PERIPHERAL NERVES

Wertheimer P: Effects of Vascular Lesions on Peripheral Nerve Lesions (Effets des lésions vasculaires sur les lésions nerveuses périphériques) Lyon chir., 1946 41 385

In this article the author stresses the neurological sequelae of vascular injuries and emphasizes the importance of the blood circulation in nerve trunks. Four cases are discussed in which peripheral nerve lesions are associated with traumatic vascular lesions. The first patient had received a gunshot injury in the left subclavicular region with fracture of the scapula at the point of exit and presented a complete paralysis of the lower brachial plexus. Electrodagnosis of the entire upper extremity but no reaction of the lower brachial plexus.

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The second patient presented a high radial nerve paralysis due to a gunshot injury of the axilla. The operation disclosed intact nerve trunks and an aneurysm of the axillary artery which was resected. Ten months later the patient showed a residual paralysis of the common extensors of the fingers and of the extensor and abductor of the thumb.

The last 2 cases presented definite causal symptoms with paralysis and sensory disturbances, one in the right upper extremity and the other in the left lower extremity. At operation adherence of the brachial artery to the median nerve and complete occlusion of the femoral artery were found, respectively. Following periarthral sympathectomies the causal symptoms disappeared and the motor disturbances receded gradually.

Peripheral nerve lesions attributed to primary vascular lesions and ischemia need careful investigation and study. The evaluation of the neurologic signs is often very difficult in the presence of a nerve lesion associated with vascular disturbances. Very little is known about the blood circulation of the nerves, although it has been shown by peripheral nerves in Seddon's recent report that peripheral nerves undergo degenerative and mesodermal proliferative changes, and even complete necrosis, in purely ischemic lesions due to disturbances in their blood supply.

GRONK PERNER, M.D.

SYMPATHETIC NERVES

Lahorda, F. M.: Sympathectomy and Hydrocephalus. Principles and Indications (Explantación e hidrocéfalo. Fundamentos e indicaciones) Rev. esp. cir., 1946, 5 23

The neurosurgical treatment of dilatation of the urinary excretory ducts should be confined to cases of functional or idiopathic dilatation in which the action of the sympathetic nervous system appears disturbed.

All 10 patients operated on by the author showed painful phenomena and had considerable amelioration of their symptoms or complete recovery after the operation.

A temporary disappearance of symptoms may be obtained by the injection of an anesthetic into the sympathetic system but permanent results can be expected only from an operative procedure such as denervation of the renal pedicle, sympathectomy, extirpation of the splanchnic nerve, or extirpation of the ganglion removal of the splanchnic nerve, or extirpation of the ganglion of the minor splanchnic nerve, or extirpation of the ganglion of the minor splanchnic nerve, or extirpation of the ganglion of the minor splanchnic nerve.

The relief of pain after the operative procedures is attributed by the author not to the interruption of the sensory paths but to the cessation of the spastic effect of infectious hydronephrosis, the pain subsided after the operation and considerable improvement in regard to the elimination of urinary retention. A recurrence of the infection but not

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INTERNATIONAL ABSTRACTS OF SURGERY

pain brought 1 patient back to the hospital after a splanchnicectomy performed for an infectious bilateral hydronephrosis. The analysis of the urinary sediment disclosed the presence of Koch's bacilli. The author concludes from this observation that no effect of splanchnicectomy on tuberculosis of the kidneys can be expected as far as the specific infection is concerned.

In regard to the effect of splanchnicectomy on the amount of dilatation of the renal pelvis and calices, no change has been noticed in 5 cases but the dilatation increased in 1 case of bilateral tuberculous hydronephrosis and decreased in 4 cases.

In 5 cases the author performed an extirpation of the aortorenal ganglion or a denervation of the renal plexus. After the operation the pains stopped but the morphologic changes remained stationary. The best results were obtained from splanchnicectomy combined with extirpation of the external horns of the semilunar ganglion and of the first ganglion of the lumbar sympathetic chain. In all such cases the relief of pain was accompanied by an objective improvement in the form of a diminution of organic lesions.

An infiltration of the splanchnic nerve is useful as a test if a transient improvement is obtained, an operation is justified. In 1 case of bilateral hydronephrosis the author successfully employed splanchnicectomy on the more affected side and infection of an anesthetic on the other side.

There are three methods of approach to the splanchnic nerve: the posterior mediastinal approach, the infrapleural route and the lumbar subdiaphragmatic method, which the author prefers to the other two. Although the wound is deep and it is difficult to employ local anesthesia, pleural irritation is avoided and the approach offers the opportunity to examine the suprarenal glands and if desired to extirpate the semilunar ganglion. The

aortorenal ganglion or a part of the sympathetic chain. In addition the last mentioned method allows the performance of supplementary operations on the kidneys, such as excision, decapsulation and suspension.

The author did not perform a bilateral resection of the splanchnic nerves. There was no mortality attributable to the operation in his entire material.

JOSEPH K. NARAZ, M.D.

MISCELLANEOUS

Chasak, A. K., and Stout, A. P. Traumatic and Amputation Neuromas. *J. & Surg.* 1946, 52, 649.

The authors analyze the neuromas found in the records of the Presbyterian Hospital, New York City. Pain, anesthesia, and paralysis were the chief complaints and they occurred in the order given. The symptoms had existed for a period of from 3 months to 20 years.

The common cause for neuromas was trauma. Accidents, industrial injuries, and amputations preceded most of them. Some followed surgical procedures. The authors believe that much difficulty has occurred because of inadequate examination following injury. They advocate prompt débridement and ligation and transplantation of the nerve if necessary. The neuroma, once formed, should be dissected from the surrounding tissues and excised in slices until normal fasciculi are seen. In the case of amputations, ligation of the nerve is recommended in order to prevent oozing of blood from the nerve end. The nerve end should be allowed to retract into the soft tissues to avoid incorporation in the scar tissue. Nothing need be injected into the nerve.

D. KELL ROCK, M.D.

SURGERY OF THE THORAX

CHEST WALL AND BREAST

Herrmann J B Adair F E. and Woodward H. O.: The Effect of Estrogenic Hormone on Advanced Carcinoma of the Female Breast
Arch. Surg. 1947 54 1

The favorable results obtained by a group of English investigators from the use of estrogenic hormones in some cases of advanced carcinoma in the female prompted the authors to try this therapeutic procedure. Seventeen patients were selected. Of these thirteen therapy had been administered a patients had recurrent lesions in the same breast several years after treatment of inoperable carcinoma by irradiation in 1 patient, a carcinomatous ulcer had developed in the mastectomy scar and in the remaining of the thoracic wall. A biopsy specimen, positive for cancer was obtained in every case.

These 17 patients were treated exclusively with a synthetic estrogenic hormone (ethinyl estradiol) administered orally. One milligram of this substance in the opinion of some investigators, is the equivalent of from 7 to 30 milligrams of diethylstilbestrol. In the present investigation, the dose of ethinyl estradiol varied from 0.15 to 0.7 milligrams daily. On the basis of the lower figure given previously this dosage would be equivalent to at least 1.0 to 5.0 milligrams of diethylstilbestrol daily.

The duration of the treatment with estrogenic hormones varies from 3 to 21 months.

To date, the cases of only one group of patients with advanced carcinoma of the breast, treated by 20 English investigators who pooled their cases (a total of 100) and presented them in a symposium. The authors findings do not differ essentially from those of the English investigators. An important point of agreement is that the favorable results have been predominant in women above the age of 60.

The results of the present investigation suggest a decidedly deleterious effect of estrogens on women in the younger age group. The effects were most striking in a 40 year old patient who was menstruating regularly. When first seen her general condition was good despite the mass in the right breast and axilla. Roentgenograms revealed no evidence of disease in the lungs, the lumbar portion of the spine or the pelvis. Soon after the institution of the estrogen therapy her condition deteriorated. Within a period of 3 months she was bedridden and death occurred about 1 month later. The rapid progress of the disease may have been the result of a specific action of the estrogen, or it may have been the result of vascular changes produced in the breast by the hormone. Illustrations showing the progress of the disease accompany the article.

Both estrogens and androgens apparently exert an inhibitory effect on carcinoma of the female breast. The pituitary gland may be the common denominator. Moore and Price have presented evidence that the pituitary may be influenced by the sex hormones. They found that gonadal hormones of either sex exert a depressing effect on the hypophysis of male rats resulting in a diminished amount of the sex stimulating factor available to the organism. Badger and his coworkers concluded from their researches that some synthetic estrogens exert an inhibition of growth on animal neoplasms. In their opinion the action might be in part local on the tumor cells and in part central on the pituitary.

In conclusion, the authors state that a favorable response was noted in 7 or 40 per cent of the patients—5 with superficial lesions of the soft parts and 3 with pulmonary metastases. The response occurred predominantly in women over 60 years of age. The breasts in elderly women may become pink and the mammae engorged. The dosages employed induced uterine bleeding sometimes severe in over 50 per cent of the patients. Vaginal smears were studied in 6 patients all of whom showed a well developed estrus reaction. There is suggestive evidence that in young women estrogenic hormones may accelerate the progress of the disease. There were no changes in serum calcium, protein or alkaline phosphatase levels that could be ascribed to the administration of daily doses of an estrogen (ethinyl estradiol). A fall in the serum phosphorus level was observed in a large percentage of cases. Hyperglycemia was decidedly reduced in 1 patient solely by the use of estrogen.

JOHN J. MALONEY, M.D.

TRACHEA LUNGS, AND PLEURA

Fisher G. E.: Primary Neoplasms of the Trachea.
South Surgeon 1947 13 78.

Abnormal growth of the cells composing the undifferentiated basal layer of the pseudostratified epithelium has the potentiality of producing columnar squamous or glandular epithelium which may result in various forms of neoplasms. The type of tumors reported that could be determined histologically have been listed as fibromas papillomas, lipomas, chondromas adenomas lymphomas, intratracheal goiter angiomas cylindromas sarcomas carcinomas and endotheliomas. This great variation in the histologic structure of tracheal neoplasms obviously indicates that there will be a similar variation in the rapidity of growth in individual tumors.

The cardinal signs and symptoms are cough, dyspnea and hemoptysis. As the growth increases in size cyanosis may develop because of increasing obstruction of the tracheal lumen. Apnea and suffocation will eventually develop if the growth cannot be controlled.

The author reports 1 case of a female, aged 60, whose chief complaint was "asthma" from which she had suffered 8 years. She had hemoptysis and blood streaked sputum. The patient was bronchoscoped just above the bifurcation of the trachea a large growth was encountered which arose from the left posterolateral wall of the trachea and filled approximately 80 per cent of the tracheal lumen. It extended downward obstructing the left main bronchial orifice. A biopsy diagnosis of carcinoid was made on morphological similarities.

The patient was bronchoscoped with an 8 mm. instrument, and the tumor was partially removed with biting forceps and as thoroughly cauterized with electrocoagulation as deemed advisable at the time. Postoperatively there was considerable improvement and a definite partial re-expansion of the left lung.

Diagnosis is most easily made upon bronchoscopic examination of the growth biopsy and microscopic examination of the tissue removed. The most satisfactory means of treatment is fulguration of the growth by means of electrocoagulation through the bronchoscope, accompanied by deep roentgen ray therapy
LEX PULLER M.D.

Overholt, R. H., Langer, L., Szypulski, J. T., and Wilson, N. J.: Pulmonary Resection in the Treatment of Tuberculosis. *J. Thorac. Surg.* 1946, 15 384.

The present day operative procedure of pulmonary resection, the risk as to postoperative complications, and the mortality are discussed. The status of a consecutive series of 191 patients on whom 300 resections were performed, is reported.

The use of the lateral position for pulmonary resection has 2 disadvantages (1) the diseased side is directly over the sound side, favoring gravity drainage of secretions from the bad to the good lung, and (2) excursions of the thoracic cage and diaphragm on the sound side are impaired by the weight of the body. In an attempt to reverse the relative positions of the two lungs during operation, the patient is suspended face down and his chest turned so that the sound lung is uppermost. This new position is advantageous from several points of view (1) operative contralateral spread of the disease has been reduced from 19 to 10 per cent (2) the possible range of respiratory excursions is greater and patients adjust themselves better to open pneumothorax, (3) the amplitude of the mediastinal swing, or displacement, is greatly reduced (4) the use of intrabronchial positive pressure can be eliminated in most cases (5) exposure of the posterior aspect of the hilum is facilitated (6) the weight of the lung allows it to fall forward, which eliminates the need for holding it up, or the use of traction during dissection and (7) cardiac irregularities and standstill have been practically eliminated as complications.

A method of paravertebral block anesthesia and intratracheal intubation after topical application has been developed, with these advantages (1) a

better control of intrabronchial secretions can be obtained retained secretions in the abnormal lung are not released by bronchial relaxation aspirations do not disturb the plane of anesthesia, or result in periods of apnea; the cough reflex is present throughout the operation (2) the anesthetic agent is less toxic; and (3) the immediate postoperative condition of the patient is better. With the use of paravertebral block and local infiltration with novocain, the incidence of contralateral spread has been reduced from 19 to 10 per cent.

Pulmonary resection is not a competitive, but a supplementary form of treatment to the collapse therapy procedures. The series of patients presented cannot be compared with any thoracoplasty series, since complicated forms of tuberculosis were present, in which collapse therapy had failed, or which were unsuited for thoracoplasty. Upper lobectomy should not be performed as an elective procedure when there is a reasonable chance to control the lesion by thoracoplasty because ipsilateral emaciation of the remaining lung frequently occurs.

Technical maneuvers considered to be particularly important are (1) avoidance of lung clamps (2) avoidance of contamination from the lung or cut bronchus (3) early preliminary bronchial ligation, (4) pleural flap reinforcement of the bronchial stump and (5) routine bronchoscopy after resection to ascertain the condition of the bronchial stump.

A final appraisal of the value of resection in the treatment of tuberculosis cannot as yet be made. Larger series of patients must be studied for longer periods of time.
SAMUEL KASER M.D.

Decker, H. R.: The Treatment of Thoracic Actinomycosis by Penicillin and Sulfonamide Drugs. *J. Thorac. Surg.* 1946, 15 430.

While actinomycosis (streptothricosis and nocardiosis) is the most common of systemic mycoses, it remains a comparatively rare disease. There has been some confusion in the classification of the Actinomycetes. In the war 2 types have been recognized as pathogenic to man (1) the Actinomycetes bovis, an anaerobic form which is gram positive and nonacid fast and (2) the Nocardia asteroides, an aerobic acid fast group, which includes the Actinomycetes gyoaeoides. Nocardia maduroe is an aerobic nonacid fast group. Both types produce mycelia, which form tangled masses of filaments recognized as "sulfur granules."

Characteristically these fungi produce a chronic granulomatous type of inflammation in which supuration, abscesses, and sinuses develop and dense scar tissue is produced in excess. The inflammation burrows through tissue with no respect for normal fascial planes and anatomic barriers. The dense fibrous tissue diminishes vascularity and renders the lesions less permeable to the action of drugs. Superimposed on the actinomycotic process, there is often secondary infection due to pyogenic bacteria.

Infection of the lung may be air borne or from fungi aspirated from the mouth, teeth, and tonsils.

Three types of thoracic disease are differentiated but are really all part of one process (1) bronchitic, in which the invasion usually starts in the bronchi, but is rarely confined to the bronchial tree (2) pneumonia, a bronchopneumonia in which the lung parenchyma is replaced by nodular or diffuse caseating infiltration which breaks down into abscesses (The usual location is in the lower or central parts of the lungs) and (3) pleuritic found in cases in which the disease spreads to involve the pleura whence the inflammation is most extensive in the chest wall whence the abscesses develop but commonly near the breast and axilla where sinuses develop. The ribs are invaded in 25 per cent of the cases and the vertebrae in 10 per cent the sternum is invaded only occasionally.

Cough is the first symptom at first it is dry but later there is mucoid sputum which becomes purulent and blood streaked. Hemorrhage is rare. Intermittent fever dyspnea malaise night sweats and loss of weight follow. Pain appears when the pleura is involved. Secondary anemia and high leucocytosis are common. Physical signs depend on the character of the pulmonary and pleural involvement. The picture is suggestive of tuberculosis. Early infiltration then areas of consolidation appear with abscess formation thickening of the pleura or marked pleural thickening erosion of the ribs and fracture of the chest wall and narrowing of the pulmonary fields are suggestive.

The early diagnosis of thoracic actinomycosis is difficult to make. It is established definitely by finding characteristic mycelia or sulfur granules in pus or fixed tissue sections. The differential diagnosis must be made from tuberculous pyogenic abscess bronchiectasis and empyema due to pyogenic bacteria.

In the treatment surgery is essential. Abscesses should be drained sinuses of the chest wall excised diseased rib removed and involved portions of the long ablated. Sulfonamides may exercise a favorable influence on the disease because of their effect on the secondary pyogenic infection. The early favorable response to sulfonamides is very often not maintained.

Penicillin is the best therapeutic agent for actinomycosis of the chest as well as for actinomycosis elsewhere in the body. If administered early it causes arrest of the disease and recovery in any case. In most cases penicillin produces a favorable outcome even in long standing cases especially if it is used with sulfonamides to clear the secondary process of infection.

Large doses of penicillin 10 to 100,000 to 200,000 units a day for about 2 weeks should be given. Sulfonamides of actinomycosis should be given in a separate test or both therapy are fairly successful for the purpose. After several weeks a course of penicillin treatment will be followed by the sulfonamides may remain latent for 2 to 3 months repeated courses of penicillin treatment.

should be given for a year and at any time when symptoms reappear. Intramuscular administration is preferable but this may be combined with intrapleural or intrapulmonary injection.

SAMUEL KAHN, M.D.

Gladnikoff H.: Genesis of Bronchiectasis, an Unappreciated Bronchodilating Force. *Archs med* 1946 126 411

There are two types of bronchiectasis, congenital and acquired. Congenital bronchiectasis is a rare condition, two forms of which have been described (a) fetal bronchiectasis and (b) atelectatic bronchiectasis in which the bronchi shortly after birth become gradually widened as a result of the developmental effect of collapse of the pulmonary parenchyma. It is however extremely difficult to differentiate between the strictly congenital and the metapneumonic atelectatic, or idiopathic. The author discusses the literature on bronchiectasis going back as far as Laennec's original description in 1819 as well as the causes and treatment of the condition.

It is believed that pressure of secretion behind a bronchial stenosis and destructive injury to the occasional cases of bronchiectasis.

The inspiratory movements of the thoracic wall and the diaphragm are a bronchodilating force of considerable magnitude when their impulses are transmitted to air-conveying bronchi through nonair-conveying lung tissue. The author believes it is possible that this force exceeds the tolerance of the thoracic walls under certain conditions. Clinical observations in pneumonia and atelectasis as well as during the genesis of bronchiectasis have shown this bronchodilating force to be the usual and possibly the only cause for the genesis of bronchiectasis.

Diagnosis while the bronchial dilatation is reversible is essential for conservative treatment. For this reason bronchography should be carried out in all cases of pneumonia and atelectasis which cannot be checked quickly or in cases of relapse particularly in children.

Apart from combating infection, the treatment of reversible bronchial dilatation should be directed towards the elimination of abnormal bronchodilating forces. With this object in view the cause of the genesis of the bronchial dilatation justifies steps for the rapid re-aeration of the consolidated lung tissue. If this proves impossible artificial pneumothorax should be accomplished but the lung should not be collapsed. If pneumothorax is impossible it may be necessary to perform a unilateral phrenicotomy.

PAUL STREIBEL, M.D.

Kay F. B. Meade R. H., Jr. and Hughes F. A.
Jr.: The Surgical Treatment of Bronchiectasis.
Arch. Surg. 1947 77 1

The clinical course of bronchiectasis is characterized by chronic relapsing varying degrees of debility

and, usually recurring attacks of pneumonia. There may be remissions with relative freedom from symptoms. The degree of disability is largely dependent on the degree of sepsis, which is dependent on the adequacy of bronchial drainage.

The destructive changes in bronchiectasis are permanent. In the development of the disease, the ciliated columnar epithelium is frequently ulcerated and replaced by nonciliated cuboidal or squamous epithelium, and the normal elastic tissue and smooth muscle fibers are partially or completely replaced by granulation or scar tissue. Because of the loss of the normal cleansing action of the bronchial tree, due to the loss of the ciliary action of the mucous membrane and the peristaltic action of the bronchial wall stasis of the exudate and resulting infection occur.

The prognosis of patients with untreated or medically treated bronchiectasis is poor. The mortality rate is said to be higher when the bronchiectasis is cystic (55%) or saccular (37%) than when cylindrical (13%). The morbidity is also considerable. Conservative therapy to improve bronchial drainage combat infection, and improve the general condition of the patient is of value. Postural and bronchoscopic drainage, breathing and coughing exercises, eradication of other foci of infection, a high caloric diet, vitamin therapy, and medication to thin the viscid bronchial exudate are all valuable adjuncts in the treatment of bronchiectasis. Penicillin is of value in the treatment of the recurrent pneumonic episodes and also decreases the sepsis and intoxication during the interval stages. But symptomatic treatment is only temporizing with the disease. Death from bronchiectasis usually results from pneumonia, septicemia, pericarditis, failure of the right side of the heart, hemorrhage, or empyema. These hazards are present as long as the disease exists.

Permanent cure can be obtained only by pulmonary resection. The operative mortality and morbidity are very small at the present time. Only 1 death occurred among 220 consecutive lobectomies. One hundred and eighty-four lobectomies were done for bronchiectasis, 20 for pulmonary cysts, 11 for chronic pulmonary suppuration, 3 for bronchial adenomas and 3 for basilar tuberculosis. The bronchiectasis in patients not operated on was either too minimal or too extensive.

The decision as to the advisability of operation depends on the amount of disability, the extent of the destructive changes and the evidence of chronic intoxication. Patients who present no significant clinical evidence of the disease and those with minimal bronchiectasis can be cared for conservatively. Those in whom all 3 lobes are involved are beyond surgical treatment. In the other cases, lobectomy is recommended if there are no contraindications to operation. The field of operability now includes

with extensive bronchiectasis on one side and minimal disease on the other or with extensive bilateral bronchiectasis as long as the right upper lobe and upper aspect of the left upper lobe are normal and the cardiorespiratory reserve is adequate.

Adequate bronchograms should be made to ascertain the degree and distribution of the bronchiectasis present. Careful bronchoscopy should be done to determine from which lobes most of the exudate is escaping and the presence of unduly active inflammation of the bronchial mucosa, to improve drainage, and to eliminate the possibility of the presence of foreign bodies or tumors. Bronchopneumometric studies to determine which is the worse side in bilateral cases, the pulmonary reserve of the uninvolved lung in dyspneic patients, and the extent of functional tissue in borderline cases, have been found to be of value.

The operation should be postponed until the patient is in as good condition as possible. From 4 to 6 weeks should elapse after bronchography to allow elimination of the iodized oil. During this time the patient is placed on a high caloric, high vitamin diet. Postural drainage should be used. A course of penicillin given through the trachea is of value in patients with copious sputum. Penicillin is given intramuscularly on the evening before operation.

All the operations have been done by the individual ligation technique. The posterolateral approach with resection of the seventh rib or the lateral approach with resection of the sixth rib gives good exposure. Elevation of the head of the operating table in combination with early operative occlusion of the bronchus keeps the exudate in the bronchiectatic abscesses and does not allow it to drain into the main bronchi and cause obstruction and perhaps, be aspirated into the opposite lung. Secure closure of the bronchial stump largely determines the postoperative course. The bronchus should be amputated high, to prevent puddling of secretions at the site of amputation later. Silk technique is used throughout. All pleuritic adhesions between the upper lobe and chest wall are severed, since they prevent the upper lobe from readjusting itself to the larger space allotted to it. Blood transfusions are begun at the outset of the operation and continued throughout its course. Usually from 500 to 1500 c. c. of blood suffice.

Postoperatively adequate oxygenation is provided by tent or intranasal oxygen for about 24 hours. Frequent intratracheal aspiration, insistence on coughing, deep breathing exercises and frequent change in position help to maintain an open tracheobronchial airway which is essential to early expansion of the remaining lobe and obliteration of the pleural space. Penicillin is given intramuscularly for 7 days. The patient is routinely gotten up by the third postoperative day.

In only 1 patient did significant shock from blood loss develop. Bronchopleural fistulas with resulting empyemas occurred in 20 cases. Atelectasis occurred in 3 cases because of intrabronchial exudate and occlusion.

Postoperative bronchopneumometric studies on 26 patients demonstrated that the function of the remaining pulmonary tissue on the operated side is

influenced greatly by the postoperative pleural complications. In no instance was the pulmonary function significantly impaired following an uneventful lobectomy. Apparently the bronchiectatic lobe contributes very little to the oxygenation of blood circulating in its pulmonary tissue as the blood returns to the heart unoxygenated and with a high carbon dioxide content. This is largely responsible for the cyanosis and dyspnea seen in these patients. On removal of the bronchiectatic tissue the blood can then be circulated only through alveoli that allow proper oxygenation and diffusion of gases.

SAUEL KAHN, M.D.

Mattel, C., Tristani, M. and Barbo, A.: Roentgenographic Aspect of the Zonal Catheterization of the Lung during the Endobronchial Instillations of Penicillin in the Treatment of Pulmonary Abscesses (Aspect radiologique des cathétérismes zonales du poumon au cours de la pénicillithérapie endobronchique des abcès pulmonaires). *Press. méd.*, 1946 54 638.

The zones of aeration in the pulmonary parenchyma with bronchial and vascular autonomy as described by Lucien Grandjean, Weber and Beau De Pierris, Coulouma, Breton and Devos have been found to be accurate and of great practical value by the authors for localizing pulmonary lesions and catheterizing the bronchi.

A brief anatomical review of the topography of these zones of aeration is given, and the schema of Lucien and Beau is reproduced (Fig. 1).

The authors have performed 1,100 bronchial catheterizations without the use of the bronchoscope under local anesthesia, using pontocaine. A 1 per cent solution was used in the pharynx and larynx, and a 0.5 per cent solution in the trachea and bronchi. Treatment was given for 63 pulmonary abscesses and various bronchial suppurative processes. They advocate the use of a curved rubber sound with an extremely opaque tip. The 63 abscesses were localized in the following zones: 40 per cent in the upper dorsal, 13 per cent in the apical, 15 per cent in the anterior zone of the middle lobe, 13 per cent in the upper area of the lower lobe and 19 per cent in the remaining zones.

All these catheterizations were made in order to deposit the penicillin as close as possible to the abscess which had been accurately localized. The authors are convinced that the solution of penicillin as well as the lipidol often reaches the foci of suppuration as illustrated by roentgenographic study.

The authors reported on 50 cases of pulmonary abscess with a complete study and follow-up, 49 of the abscesses had been active for more than 2 months. It is believed that 20 (40%) clinical and roentgenographic cures were maintained from 6 to 12 months in 16 (32%) of the cases clinical improvement was obtained but there was persistence of a few roentgenographic findings in 5 cases (10%) there was improvement characterized by disappearance of the foul odor and almost complete suppression of expectoration and marked improvement of

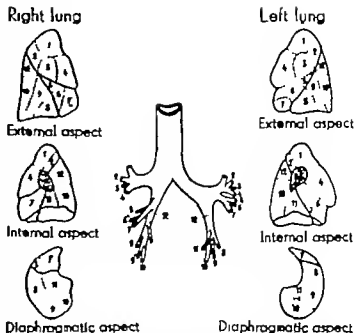


Fig. 1 (Mattel *et al.*) Upper lobe 1 apical area, 2 dorsal, 3 external, 4 ventral. Middle or lingual lobe in the left lung; 5 external, 6 posteroexternal, 7 anterointernal. Lower lobe 8, ventrodorsal, 9, laterobasal, 10, dorsobasal, 11, infracardiac, 12, mid-dorsal. The numeration of the bronchi correspond to those of the zones which they ventilate. (Thirteen other patients under treatment had similar localizations.)

the general condition of the patient but persistence of the roentgenographic findings. Finally, the authors state that there were 9 (18%) failures, of which 6 occurred in cases presenting neoplasms. In these cases only the amount of suppuration was diminished. Three cases presented true abscesses and made absolutely no response to treatment. Two of the abscesses were in polycystic cavities and 1 abscess was an atypical one with no collapsible cavity.

These results, which seem to stand the test of time so far, prove the value of this simple method of endobronchial instillation of penicillin in the treatment of pulmonary abscesses.

GERARD GAUMON, M.D.

Soubrié, A., Morera, J. and Labourt, P. E.: The Incidence of Pleuropulmonary Perforation following Intrapleural Pneumolysis, as Determined by Analyses of the Intrapleural Gases (Frecuencia de la perforación pleuro-pulmonar en la neumolisis intrapleural. Estudio de los gases pleurales). *An. Calif. pat. clin. labor.* 1945 7 330.

The composition of pneumothorax gases was determined before and after intrapleural pneumolysis in 50 patients. Based on these findings, evidence of bronchopleural communication was found in 5 cases after the division of substantial adhesions and in 1 case it was recorded after the sectioning of filmy adhesions only. The authors thus consider the incidence of such fistulas as a result of the operation to be 10 per cent.

In 3 cases evidence of a fistula was encountered before operation.

The results of the analyses in these 50 cases are given.

HERMAN T. LANGSTON, M.D.

Kantorak, R.: Superior Pulmonary Sulcus Tumors (Nádory plicních hrotů). *Lék Ústý* 1945 1: 354.

Malignant tumors of the pulmonary apices demand for their recognition not only a close roentgenographic study including tomography and perhaps kymography but also close clinical observation of the characteristics and development of the morbid process. The most typical malignant growth in this region is that denominated by Pancoast, the superior pulmonary sulcus tumor. This particular growth is characterized, as a rule, by a very striking combination of symptoms, including a peculiar form of neuralgic involvement of the brachial plexus, with pains in the arm and shoulder, insensibility of the elbow region, and sensations of burning and formication in the regions of the hand and fingers of the involved side. When this tumor is present the sympathetic is also very frequently involved, which results in a Horner's syndrome. The third characteristic of Pancoast's tumor is the roentgenological evidence of the eroding effects on the ribs, particularly the posterior section of the third rib. The roentgen findings, of course, are similar for all the tumors in this region. However the sarcoma is more sensitive to irradiation therapy and the endothelioma, arising from the pleura, grows more slowly. However the carcinoma is sufficiently sensitive to be reduced in size by roentgen therapy which does not, however hinder its strong tendencies toward metastasis.

Differential diagnosis is a difficult problem in tumors of this region. Of chief concern, of course, is the evidence of healed tuberculosis with its cicatricial retraction and infiltration. However a tumor should be easily distinguishable not only through its constant growth in size, but also through its deeper more homogenous and smooth bordered shadow. Metastases in this region are usually recognizable as such not only through their usual multiplicity but also by evidence of the parent tumor elsewhere. Atelectasis is an important thing to look for in the surrounding lung tissues since it is frequently absent in the presence of shadows of other origin than tumor (lymphogranulomatosis, actinomycosis, Hodgkin's disease).

Nevertheless, the diagnosis of the condition present in this region will often prove to be a tremendous problem, and in the final paragraph the author suggests that the diagnosing physician depends on a certain amount of intuitive feeling but always, of course, tries to make the diagnosis on an objective basis.

JOHN W. BRIDGEMAN, M.D.

HEART AND PERICARDIUM

Mahre, E. D.: Coarctation of the Aorta. *N. England J. M.*, 947: 35.

Advances made by surgeons in handling the great blood vessels have stimulated new interest in coarctation

tion of the aorta. The author's case presentation includes a discussion which re-emphasizes much of what Sir Thomas Lewis wrote about this subject.

Coarctation of the aorta is generally classified into two anatomic groups, both of which are located, for the most part, in the distal portions of the arch: (1) the first form, known as the infantile type, is characterized by a generalized narrowing of the arch in its distal portion, extending from the origin of the left subclavian artery to the region of the ductus arteriosus (Clinically this is a rare form and is so frequently accompanied by other major cardiac anomalies that death occurs in infancy) and (2) the adult type is characterized by an abrupt narrowing, sometimes to the point of obliteration, of the aorta in the proximity of the insertion of the ligamentum arteriosum (This is not a rarity various observers having reported an incidence of 1 in 1,550 cases at autopsy). The more favorable life expectancy in the second group results from an adequately compensating collateral circulation, as well as from the fact that the associated developmental anomalies, if any, are less serious than those found in the infantile type. In the main, these anomalies fall into two groups: (1) those of the heart and great vessels, including bicuspid aortic valves, anomalous origin of the arteries of the aortic arch, persistent left superior vena cava, aortic septal defects, and subaortic stenosis and (2) anomalies of the body at large, such as hypospadias, absence of a kidney, vertical position of the stomach, horseshoe kidney, diaphragmatic hernia, subluxation of the joint, slight mongolism, ichthyosis, pigeon breast, and congenital cerebral vessel aneurysm.

Embryologists give the following explanations of the development of coarctation of the aorta of the adult type:

1 (Brunner) The tissue of the ductus arteriosus, at its junction with the aorta, which shortly after birth becomes completely stenosed, anomalously incorporates the contiguous portion of the aorta in this obliterating action. The primitive fourth arch (aorta) falls prey to the obliterating action of the primitive sixth arch (ductus).

2 Others point out that the ligamentum arteriosum exerts a ropelike tugging on the aorta at the junction of the two, which causes a kinking of the aorta that results in stenosis.

3 (Reynaud and Rokitsansky) Embryonic maldevelopment of the descending limbs of the primitive left aorta causes the coarctation in those cases in which stenosis occurs proximal to the origin of the left subclavian artery or in the abdominal aorta.

The important symptoms of the adult type, beginning after years of apparent good health, consist mainly of breathlessness and palpitation after exertion, fatigability, slight cough, sometimes giddiness with hot flushing of the face, headaches, and thoracic pain. (The author's patient was referred by a neuropsychiatrist to whom he had been sent because of nervousness.) The physical signs include

1 Foremost, the reversed relation of the brachial and popliteal arterial blood pressures.

1. The femoral pulsation is weaker with a definite lag in its summation, compared to that of the radial pulse the lag is 0.145 of a second according to accurate measurement by Sir Thomas Lewis.

3. Visual, palpable, or auditory evidence of increased pulsations of various arterial branches of the aorta.

4. Sulcation along the inferior margin of the posterior portions of the ribs.

5. Absence of the aortic knob and extension toward the neck of the silhouette of the supracardiac vessels.

The author makes the well taken point that too often in cases of hypertension no effort is made to determine the blood pressure in the lower extremities, so that without any doubt cases of coarctation of the aorta are frequently missed.

EDMOND J. AUDI, M.D.

ESOPHAGUS AND MEDIASTINUM

Udhe G I: Chemical Burns of the Esophagus. *Ann Otol Rhinol.*, 1946 55 705

The clinical records of all patients treated for chemical burns of the esophagus at the University of Oregon Medical School Hospitals during a 15 year period were reviewed. An analysis of these findings is presented.

In the present series, there were no deaths as a result of peroral instrumentation. The esophageal silver salt, lactic acid and lyso are given. The patient in this case died of brain abscesses of both temporal lobes, which is interesting in view of the fact that deaths from brain abscesses under similar conditions have been reported by other authors. The course of action taken at this hospital in the treatment of acute esophageal burns together with arguments pro and con, is discussed.

The following procedure is carried out in all cases of esophageal burns (1) immediate neutralization of the poison (2) immediate swallowing of a size D twisted (not braided) silk thread on completion of procedure 1, (3) treatment to avoid dehydration and starvation, (4) consultation with an otolaryngologist within 24 hours (5) examination with barium under fluoroscopy and with flat plates as soon as the initial fever subsides usually in 7 to 10 days (6) esophagostomy after determination of the site and degree of obstruction by procedure 5 (7) following the esophagus bouginage up to 45 French in an adult carried out once or twice weekly or less often depending upon the stricture's reaction to bouginage and the patient's ability to swallow. Bouginage is performed over a period of 6 months to 2 years, depending upon the results (8) if frequent bouginage is unsuccessful that is, if the child is in danger of becoming malnourished with a retardation in normal development, a gastrostomy is performed, the esophagus is placed at rest, and the stricture is dilated in the retrograde manner advocated by Tucker

JOHN J. MALONEY, M.D.

Ladd W E and Swenson O: Esophageal Atresia and Tracheoesophageal Fistula. *Ann Surg* 1947 125 33

Esophageal atresia and tracheoesophageal fistula received comparatively little recognition and aroused little interest among clinicians until the last decade. The anomaly is quite common occurring about as frequently as harelip and cleft palate.

There is a wide variation in the pathological findings. No 2 cases are exactly alike. Ladd describes 5 types. In Type I the upper portion of the esophagus ends in a blind pouch in the region of the body of the first or second dorsal vertebra, and the lower segment of the esophagus begins again in a blind pouch at the level of the fourth or fifth dorsal vertebra. In Type II the upper segment of the esophagus ends in a fistulous tract entering the trachea just above its bifurcation, whereas the lower segment is much the same as in Type I. In Type III, the upper segment ends blindly as in Type I whereas the lower segment is connected to the trachea by a fistulous tract just above the bifurcation. This type and Type IV are by far the most common in the reports of the literature as well as in the authors' experience. Type IV is similar to Type III except that the fistulous tract of the lower segment enters the trachea at its carina instead of just above its bifurcation. In Type V both the upper and lower segments communicate with the trachea.

If a newborn infant becomes cyanotic and shows an excess of saliva or frothy mucus in the mouth the diagnosis of esophageal atresia should be considered. If subsequently the infant vomits all fluid offered almost immediately after it is given the diagnosis should be strongly suspected and steps taken to confirm or disprove the suspicion. First, a No. 8-F or 10-F soft rubber catheter should be introduced into the esophagus, preferably under the fluoroscope, and if this meets an obstruction 10 or 12 cm. from the lips the diagnosis is confirmed. The diagnosis should now differentiate between the types of the malformation, which is done with the help of the roentgen rays.

The preoperative preparation of these patients is important. They should be placed in an oxygen tent for the administration of oxygen in high concentration. Then a small soft rubber catheter is introduced into the pharynx and attached to constant suction. By this means and by keeping the infant in a slight Trendelenburg position the air passage can be kept fairly clear and respiration made much easier. Transfusion and parenteral fluids should be given as indicated.

All attempts to remedy esophageal atresia with tracheoesophageal fistula without direct ligation of the fistula have failed. The retropleural operation through the right side of the back has given the best results, and cyclopropane has been the anesthetic of choice.

After dissection down to the segments of the esophagus, judgment and experience are of value in

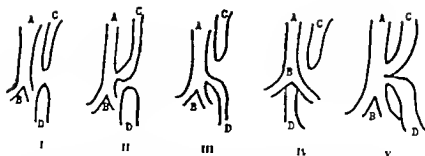


Fig. 2. (Ladd, Swenson) Diagram showing the arrangement of the trachea and esophagus in 5 types of esophageal atresia and tracheoesophageal fistula. The letters refer to the following structures: A, trachea; B, bifurcation of trachea; C, upper segment of esophagus; and D lower segment of esophagus. (New England Journal of Medicine.)

determining whether a primary anastomosis should be attempted, or the simpler operation of tying and cutting the tracheoesophageal fistula should be done. The decision depends on the condition of the patient and the distance between the two ends of the esophagus. If the space between the two segments is much over 2 cm., the chance of performing an anastomosis without tension is not good.

When the conditions indicate, an end-to-end anastomosis is done, the upper blind end being freed well up above the first rib, so that it can be brought to the lower end without tension. The lower segment is isolated and cut away from the trachea almost in the tracheal wall, in order to give it maximum length. As the esophagus is separated from the trachea, the opening into the trachea is closed by a running suture of fine silk, and this row of sutures is in turn, covered by a second layer of running sutures of the same material. The final step is the suturing together of the two ends.

In patients in whom the ends are too widely separated to warrant a primary anastomosis, a multiple stage procedure is adopted. At the first operation the site of the atresia is approached as described for primary anastomosis. The lower segment of the esophagus is cut away from the trachea at the site of the fistula, both ends are tied, and an over-and-over stitch is placed to insure against leakage. This having been done, the chest wall is closed.

During the next few days the patient is kept in slight Trendelenburg position and constant suction is applied to the upper segment of the esophagus to prevent aspiration of saliva and mucus. In this interim the baby's fluid balance is maintained by the intravenous administration of blood or plasma, and saline or glucose solution. At the end of 2 or 3 days, under local or cyclopropane anesthesia, a gastrostomy is performed through a high left rectus incision. This enables the infant to be fed and obviates the necessity of continuing parenteral fluids.

The third stage of the operation is performed 1 or 2 days after the gastrostomy and consists of bringing the upper segment of the esophagus out in the neck.

After these procedures have been completed, an indefinite period elapses before an anterior thoracic esophagus is constructed. The stomach and esophagus can be connected by an epithelial lined tube made over the left chest wall and covered by a tubed graft taken from the right axilla. In other cases a segment of jejunum is attached to the lower end of the skin tube. An appropriate loop is freed, the jejunum divided and the proximal end closed. A side to side anastomosis is made between the closed jejunum and a loop farther distalward. The skin of the chest is tunneled under from the cephalic end of the incision through which the jejunal loop is secured to a point under the opening of the skin tube. The proximal end of the jejunal loop is drawn through this subcutaneous tunnel and sutured to the lower end of the skin tube. Provided there is no evidence of inflammation at the site of the dermo-jejunal anastomosis, the patient is given water by mouth on about the tenth postoperative day. These patients can swallow liquids and solids easily and only occasionally is it necessary to promote the emptying of the skin tube by manual pressure.

The authors appreciate that the mortality from esophageal atresia should be further reduced, but there undoubtedly will continue to be an appreciable mortality because of associated anomalies incompatible with life. Among the 76 cases reported in the article, there were 45 deaths, a mortality of 60 per cent.

STEPHEN A. ZIEGLER, M.D.

MISCELLANEOUS

Draah, E. G.: Intrathoracic Metallic Foreign Bodies. A Review of the Literature. *South. Surgeon*, 1947 13: 1.

During World War II, 2 out of 10 wounds were due to bullets and 8 were due to high explosive shells. About 10 per cent or less of retained foreign bodies are bullets the remainder are high explosive shell fragments. The mortality and morbidity of shell fragment wounds is higher because of their greater frequency the irregular fragments do more damage, and the wounds show a greater percentage of infections

because the shell fragments tend to carry extraneous material into the tissue.

In field and evacuation hospitals in Italy the treatment of chest injuries was primarily directed at the conservation of life by restoring normal cardiorespiratory physiology treating shock by blood replacement, and preventing infection.

In general, the majority of patients with thoracic wounds seen in forward hospitals, recovered on a system of blood replacement débridement and closure of chest wall wounds, aspiration of blood and air from the pleural space, insertion of an intercostal catheter for tension pneumothorax, and novocain in tercostal block for fractured ribs.

Operations other than simple débridement were done in forward hospitals only when there was evidence of gross continued bleeding uncontrolled bronchopleural fistulas, or evidence of transdiaphragmatic or esophageal injury.

In the Mediterranean Theater foreign bodies of over 1 cm. in greatest diameter in the pleura or lung, were to be removed in the thoracic surgical center in the base hospital. Operations were indicated for prevention of infection or removal of clotted blood from the pleural space. Failure of the lung to re-expand progressively and quickly within 4 weeks of adequate drainage was accepted as an indication for thoracotomy and decortication.

Foreign bodies causing symptoms should be removed as soon as expedient. Asymptomatic foreign bodies over 1.5 cm., were removed in from 4 days up to 3 weeks of injury. When present as long as from 3 to 4 weeks fibrosis about the foreign bodies made thoracotomy more difficult.

The validity of removing asymptomatic shell fragments as a prophylactic procedure can only be decided years later when operative morbidity rates are compared with the percentage of complications which develop in patients with retained shell fragments. Harkins reported that only 8 per cent of patients with chest wounds had foreign bodies which required removal. They were removed to prevent hemorrhage and suppuration. Other factors considered were size and irregularity proximity to major vessels and bronchi, dependent position in the parenchyma, and the surrounding reaction as determined clinically and by means of x-ray.

D Abreu reports a series of 260 cases of penetrating wounds of the thorax with 84 retained foreign bodies, 16 lung abscesses, 77 empyemas and 15 deaths.

Parker and Burford reported 75 serious complications among 291 cases of intrathoracic foreign bodies. These were empyema late or recurrent bronchopleural fistula, lung abscess, delayed or recurrent hemoptysis, secondary intrapleural hemorrhage from the lung, and mediastinal abscess. Ten per cent of their cases operated upon had complications.

Tudor Edwards condemns the removal of intrathoracic foreign bodies in forward hospitals since wounds heal well in the presence of uninfected foreign bodies. He points out complications may occur as late as 20 years after wounding. He removes large

foreign bodies when sepsis is not present in the fifth to sixth week. He thinks all irregular foreign bodies should be removed from the lung in order to prevent secondary lung changes.

Paine in a North African general hospital reported 66 patients with retained thoracic foreign bodies none of which were operated upon. None had complications and none had symptoms referable to the foreign bodies. Twenty five of his patients returned to duty.

Blades at Walter Reed thinks each case should be individualized and considers whether foreign bodies produce signs or symptoms, size and position of the fragment and the psychosomatic effect on the patient. He reports 30 cases of which 16 had removal with no deaths.

Garland in reporting his experience in a naval hospital had 150 cases of intrathoracic foreign bodies only 20 of which were causing symptoms. Removal was undertaken in 10 cases without a death.

The experience of thoracic surgeons in the chest centers of the United States is different than that of the overseas surgeons. Without the urgent need to return men to duty their attitude and approach is more conservative than that of the chest surgeon stationed in the forward zones.

Foreign body localizers were not very satisfactory and were little used. A bronchogram is often of value in designating the segment of the lung involved.

There is apparent uniform agreement that foreign bodies in and about the heart and pericardium should be removed if operation is feasible. This generally applies to mediastinal foreign bodies also because of the danger of erosion of important structures. In traspulmonary foreign bodies if small and multiple should not be removed according to the evidence presented. The lung tolerates rather well sterile metallic foreign bodies but not those associated with infection nor those consisting of cement bone clothing, or other organic material.

The late symptoms of foreign bodies consist of (1) migration symptoms (2) erosion of vessels or bronchi (3) recurrent infection (4) pleural irritation (5) nerve pressure, and (6) changes in adjacent structures due to the injury or presence of the foreign body.

Silent foreign bodies less than 3 cm. in diameter probably should not be removed. Larger foreign bodies should be removed to prevent late complications. Veterans who present themselves for consideration of removal of intrathoracic foreign bodies should be carefully studied to see if the symptoms are actually due to the foreign body or are psychosomatic in nature. The removal of foreign bodies in a small number of cases may be justified on the latter basis after psychiatric consultation.

ROBERT R. BRIDLOW, M.D.

Colombo G.: Contusions of the Thorax (Contusioni del torace). *Minerva med.*, Tor. 1946 37 378.

The author reviews the types of thoracic injuries caused by contusion and makes brief suggestions concerning therapy. Under lesions of the thoracic cage are included superficial contusions of the chest

wall contusions of the breast (particularly during lactation) sternalocostals, fractures of the ribs, clavicle, and sternum, and luxation of the clavicle. Attention is directed to the syndrome of thoracic shock resulting from trauma of more or less violence but of brief duration and believed to be due to a disturbance of the autonomic system which results in splanchnic vasodilatation. In contradistinction is the syndrome of thoracic compression or traumatic asphyxia due to long continued reduction of the chest capacity which probably exerts pressure on the superior vena cava.

Under intrathoracic syndromes resulting from contusion injuries are listed lacerations of the parietal pleura, subcutaneous emphysema, pneumothorax, mediastinal emphysema, hemothorax and empyema. Space is devoted to the diagnosis and treatment of pneumothorax under pressure and the strain of the right side of the heart which may occur in that condition. Brief mention is made of lesions involving the pericardium, the heart, and the great vessels in the mediastinum, and in conclusion, of lacerations of the thoracic duct, esophagus, and thymus.

EDWIN B. FAIRBANKS, M.D.

Candolin, Y.: On Diaphragmatic Hernia. *Acta chir scand* 1947 95 6

Diaphragmatic hernia may not be a very common affection but the author believes that it is by no means as rare as it is often held to be, because of the fact that an erroneous diagnosis is frequently made. This tendency is facilitated on the one hand by the fact that the hernia is situated deep in the center of the body, resulting in indefinite and obscure symptoms, and on the other hand by the fact that the etiology varies. With the development of diagnostic facilities there follows a rise in the number of cases met with thus 30 cases were diagnosed as diaphragmatic hernia at the Mayo Clinic during the 25 year

period from 1900 to 1924 and 197 cases have been observed during the ten year period from 1925 to 1935. Diaphragmatic hernias may be grouped into several different classes according to their origin, namely traumatic, congenital and so called acquired hernias. They are classified further as genuine with a hernial sac, and as false without it.

The author stresses the fact that the only means of curing diaphragmatic hernia is by operation. He reviews 8 personal cases and points out the most common locations of hernia through the diaphragm. He summarizes his cases as follows:

Eight cases of diaphragmatic hernia have been observed at the Central Hospital of Abo since 1934. In 4 of these the hernia was the result of a perforating trauma and in 1 case the result of blunt trauma. In 3 cases the condition was congenital and in 1 case the patient had a hiatus hernia. In 4 cases the hernia was incarcerated and in 1 of these the incarceration arose in connection with a six months' pregnancy; the hernial sac had filled the whole of the left part of the thorax and contained half the ventricle, the whole of the small intestine and the major portion of the large intestine, as well as the pancreas.

The author used the abdominal approach in operating on 5 of the patients, 2 of whom died; the thoracic route was used in 1 case this patient died. 2 patients were not operated upon and 1 of these died from incarceration. All survivors are classed as bullet or splinter cases. The author is of the opinion from a technical point of view that a laparotomy can be less difficult than one might imagine. The diagnosis of diaphragmatic hernia is not an easy task and confirmation by x-ray examination with contrast media is imperative. When the diagnosis has been ascertained and the health permits, operation should be performed preferably during an interval devoid of symptoms. PAUL MANNIX, M.D.

SURGERY OF THE ABDOMEN

ABDOMINAL WALL AND PERITONEUM

Glenn, F : The Surgical Treatment of 1,545 Hernias. *Ann. Surg.* 1947 135 72.

Fifteen hundred and forty five hernias treated surgically over a five year period (1940-1944) are reported.

The majority of the postoperative complications are systemic and are of vascular or pulmonary origin. Local complications for the most part are due to infection.

Fifty per cent of the deaths, and many of the complications, occurred in patients who presented themselves for operation with acute hernia. This term has been employed to designate those patients who require immediate operation because of incarceration or strangulation of the bowel. An incarcerated hernia may not necessarily be an emergency but immediate operation to exclude the possibility of strangulation is often indicated because the transition from incarceration to strangulation and intestinal obstruction occurs too frequently to be disregarded.

Recent literature reveals that at the present time silk is employed most frequently in the repair of hernia. Cotton suture material is becoming more popular and the use of steel wire, as advocated by Babcock, is increasing.

As other reports on the experience of early mobilization of patients have appeared, it is evident that the trend to get patients (who have had repair of direct inguinal hernia of the congenital type) out of bed on the day following operation, is justified. However until longer follow up studies are available definite conclusions cannot be stated. The mobilization of the structures in the repair of any hernia and their meticulous approximation without tension, by suture material that produces the least reaction, as insisted upon by Halsted in 1893 remains the important principle in this field of surgery.

JOHN J. MALONEY M.D.

Bhaskar, M. V. : Strangulated Inguinal Hernia: Observations in 80 Cases. *Arch. Surg.* 1947 54 41.

The author attempts to describe the morbid anatomic evolution of a strangulated hernia based on his experience with 80 cases seen in Bombay India.

The anatomic changes that are brought about as a result of the constriction which gradually leads to strangulation affect the mesentery, the blood vessels in the mesentery and in the bowel wall, and the wall of the intestine itself.

Twelve cases are illustrated to depict, in chronological order the seven stages in the evolution of a strangulated hernia, from the stage of mere congestion to one in which the intestinal loop becomes nonviable, the pathologic appearances in the formation of a hematoma, from the stage of dilatation of the veins in the mesentery to the stage when a hematoma

may occupy a large portion of the mesentery and the relation between the changes that take place in the mesentery and the bowel wall.

One may therefore conclude that the seven stages in the evolution of a strangulated hernia are the stage of congestion, the stage of cyanosis with edema of the mesentery and visible dilated veins, the stage of appearance of hemorrhagic spots, the stage of cyanosis with hemorrhagic spots, the stage of cyanosis of the bowel wall with a hematoma in the mesentery, the stage of deeper cyanosis with blue black bands in the wall of the intestine or a rough wet, blotting paper appearance with a large or peripheral hematoma in the mesentery and the stage of nonviable loop.

In every case the bowel wall that appears affected always corresponds to the portion of the mesentery which is also affected. The margin of the hematoma and the line of demarcation of the affected and normal parts of the loop always stop short sharply at the line of constriction.

Clinically as a guide to the surgeon who is operating on patients with strangulated inguinal hernia, the cases can be divided into three groups, as follows:

One group consists of cases in which, on opening the sac, only the color of the bowel wall is found to be slightly altered, the bowel being normal in every other way and peristalsis present as in the normal intestine. In such cases the intestinal loops may be immediately and safely returned into the abdominal cavity.

A second group consists of cases in which there are changes in the bowel wall and/or in the mesentery—changes affecting the color and condition of the bowel wall in varying degree and changes in the mesentery from its mere thickening to a large hematoma. When the changes are slight, the normal color returns within a short time after relief of the constriction and the application of packs of warm isotonic solution of sodium chloride. In more advanced cases it may take several minutes before any appreciable change in the color may be detected. Also it may take some time for the peristalsis to reappear, but once the peristalsis has definitely begun, no matter what the color, feel or odor of the bowel wall and/or of the mesentery may be, so long as reduced peristalsis persists and there is no perforation, the loop may confidently be returned to the abdominal cavity. The presence or absence of peristalsis is the only sure token of the viability or nonviability of the bowel wall and is the only sure criterion as to whether the intestines should be returned into the peritoneal cavity.

In the third group are included the cases of strangulation in which the loop does not regain its peristaltic power and must therefore be considered as nonviable, even if the color and other changes are not those typical of a nonviable loop. In such cases appropriate surgical procedures must be carried out.

All 50 of the patients were males, and all were operated on under spinal anesthesia.

The hernias were of the indirect inguinal type and the majority were on the right side. There were no cases of bilateral strangulation.

In the majority of the cases (36 or 72 per cent) the sac contained loops of small intestine.

Of the 50 patients, 5 (10 per cent) died before their discharge from the hospital.

A brief description of the operation is included.

HARRY W. FOX, M.D.

Blintcliffe, E. W.: Mesenteric Vascular Occlusion. *Br. J. J.*, 1947, 2, 50.

Occlusion of the mesenteric vessels is not common; the diagnosis is difficult, and the mortality rate is high. Believing that with wider recognition and earlier treatment the gloomy prognosis would be improved, the author discusses the anatomy, pathology, and etiology of the condition and considers the diagnosis and treatment.

The occlusion primarily may be arterial or venous, the latter being more common, but with development of the condition both arteries and veins are involved. Arterial occlusion is usually due to an embolus derived from mitral stenosis, mural endocarditis, atheroma, pulmonary vein thrombosis, or pyemia. The superior mesenteric artery is more often involved than the inferior.

The cause of venous thrombosis frequently cannot be demonstrated; portal pyemia or thrombosis secondary to appendicitis, diverticulitis or pelvic infection is an important factor as all of the mesenteric venous circulation passes through the liver. Portal obstruction due to cirrhosis, peripheral venous thrombosis, and changes in the blood *per se* such as polycythemia rubra, leucemia, or anemia may be the initial lesion.

The diagnosis of mesenteric vascular obstruction is difficult; the symptoms are essentially those of intestinal obstruction and peritoneal irritation. In cases of massive occlusion the element of obstruction may be overshadowed by signs of internal hemorrhage due to the large amount of blood which may be lost from the infarcted intestine. Some of this blood may become evident as hematemesis or melena. Salient points to note in attempting a diagnosis are:

(1) history or signs of a possible causative lesion—for example, endocarditis or cirrhosis; (2) melena or the revelation of blood on rectal digital examination or on enema; (3) the presence or previous history of vascular occlusion elsewhere; (4) the presence of a blood dyscrasia; and (5) severe pain, often greater on the left side, associated with signs of intestinal obstruction, free abdominal fluid, and sometimes a palpable mass. A differential diagnosis from other types of intestinal obstruction, perforated peptic ulcer and acute pancreatitis must be made.

Exploratory laparotomy must be undertaken early; 95 per cent of patients who are untreated will die, and the time factor is as important as in perforated ulcer. Wide resection of the bowel and

mesentery extending into healthy tissue, is required, and the presence of a second infarct involving another loop of bowel must not be overlooked. While the author recommends primary anastomosis of the small bowel segments, he believes that external drainage should be carried out in cases in which the colon is involved, with the continuity being re-established at a later date.

Two cases of mesenteric venous thrombosis with complete recovery are presented. The possibilities of the use of heparin as an adjunct to surgery is suggested.

WAYNE CAMERON, M.D.

Altamier, W. A. and Holzer, C. E.: Primary Torsion of the Omentum. *Surgery*, 1946, 20: 810.

Obesity and strenuous physical activity are probably important predisposing factors of omental torsion, although the true cause is probably still unknown.

The location of the mass in the right portion of the omentum, usually just above the level of the incision, supports the opinion of Morris that the right half of the omentum is longer and more subject to torsion.

Idiopathic torsion of the omentum is a rare condition, only 64 previous cases having been reported in the literature. Its cause is obscure, but adiposity and strenuous physical activity apparently are predisposing factors.

The condition is usually confused with acute appendicitis, but should be suspected in an obese or robust patient complaining of pain of several days duration in the right lower quadrant of the abdomen, beginning during strenuous physical activity and being unassociated with vomiting.

The treatment of choice is excision of the gangrenous portion of the omentum with ligation of the vessels of its pedicle. The prognosis is excellent.

Primary torsion of the omentum should be looked for when laparotomy for acute appendicitis reveals a normal appendix and no other explanation of the clinical signs and symptoms, particularly the presence of sanguineous intraperitoneal fluid. A careful search is necessary to demonstrate the lesion, which is usually located in the right paracolic gutter or lower portion of the right upper quadrant of the abdomen.

JOSEPH GARTER, M.D.

GASTROINTESTINAL TRACT

Brummer, P.: On the Mucin Content of Gastric Juices. *Acta med. scand.*, 1946, 25: 284.

Five methods of mucin determination and their shortcomings are briefly discussed. The methods are based on (1) surface tension or viscosity; (2) measurement of the sediment after spontaneous centrifuging; (3) estimation of the nitrogen content of the gastric juice; (4) the reductive power of mucin measured either directly or after acid hydrolysis; and (5) the estimation of the turbidity produced by trichloroacetic or salicylsulfonic acid precipitate.

The author sought first to separate mucin from the proteins in the gastric contents. Picric acid precipi-

tated the proteins completely leaving the mucin totally unprecipitated. The mucin was then precipitated from the filtrate with alcohol. The author gives in detail the specific steps in his procedure.

Studies were made of 313 specimens of gastric juice from 145 persons, 50 of whom were healthy and 95 of whom suffered from various gastric disorders. The mucin content of the gastric juice varied from 0.15 to 1.5 per cent, the average being about 0.5 per cent. No definite relation between the macroscopic mucinuity and the mucin content was found to exist as the colloidal state of mucin depends upon the acidity of the gastric juice. Therefore, mucin appears to be absent or of small quantity when acidity is high.

After test meals the mucin content was slightly higher than when the individual had an empty stomach. Histamine and insulin appeared to have no effect on the mucin content. Vagotomy has been reported as increasing the mucin content but the few cases checked by the author did not support this finding.

The mucin content in cases of peptic ulcer and gastritis was within normal limits. This is contrary to the previous conception that a lowered mucus content exists in peptic ulcer and is of importance in its pathogenesis. No other clear evidence could be found of any difference between the mucus content of the gastric juice of healthy individuals and that of individuals suffering from various gastric disorders.

FREDERICK C. HOSWEL, M.D.

Efskind, L.: The Problem of Hypoproteinemia in Delayed Gastric Emptying after Stomach Resection. *Acta chir scand.*, 1947, 95, 81.

The author takes issue with the commonly accepted thesis that postoperative hypoproteinemia is a direct cause of retention in gastrointestinal anastomoses. It is commonly accepted that the underlying cause of defective passage in such cases is due to edema of the anastomotic line.

The present study is based on the analysis of 318 patients who underwent a Moynihan type of gastric resection. The material is analyzed on the basis of the patients who had retention complications and in whom serum protein studies were made both with and without protein therapy. Evidence of external edema was correlated.

Most of the patients with retention who showed signs of protein alterations were subjected to an intensive parenteral administration of protein in the form of serum or blood. The effect was very variable. Only in a very few cases was there improvement of passage after protein restitution within a short enough period of time to be significant. However such treatment had a very positive effect on external evidences of hypoproteinemia, such as ankle edema.

It is concluded that in acute hypoproteinemia following gastric resection the edema about the anastomotic line is not demonstrably related to postoperative passage delay in chronic hypoproteinemia with anemia, the concomitant occurrence of these conditions with carcinoma is so frequent that a causal rela-

tionship between hypoproteinemia and edema about the anastomosis cannot be made with certainty. Furthermore, patients with external evidence of hypoproteinemic edema do not have a higher retention frequency than those without edema. Thus, it would seem that visceral edema plays a negligible role in delay of postoperative passage and explains the author's poor results with protein therapy for this postoperative complication. Protein therapy had a good effect on hypoproteinemic ankle edema but did not relieve obstructive symptoms related to possible edema of the anastomosis.

HAROLD LAUFMAN, M.D.

Zettergren, L.: On Pyloric Hypertrophy in Adults. *Uppsala läk fören förh.*, 1946, 53, 83.

The author gives a report of 12 cases pathologically diagnosed as hypertrophy of the pylorus in adults. The patients of whom 4 were women displayed protracted trouble of the gastroduodenitis type some with signs of pyloric stenosis. In 10 cases in which carcinoma of the stomach was found resection was performed. The sections revealed pronounced muscular hypertrophy chiefly of the inner coat of the tunica muscularis in the antral portion of the ventricle. The condition was analogous to infantile pyloric hypertrophy. The hypertrophy reached its maximum at the pylorus and diminished in degree toward the oral part of the antrum. In most cases there were signs of chronic gastritis which, in the author's opinion, can play a certain role etiologically. There occurred neither ulcer nor cicatricial ulcer in the mentioned parts of the ventricle in any of the cases. The author considers that there is no connection with the infantile pyloric hypertrophy, but, similarly spastic conditions are sometimes found to occur in the thickened musculature.

The possibility of making a clinically correct diagnosis is discussed. Therapeutically internal treatment with diet and antispasmodics should have a good effect on the spasm in itself while the performance of gastroenteroanastomosis should be a more adequate way of dealing with an organic muscularly conditioned pyloric stenosis provided there is no byperacidity. The skill of the surgeon in estimating the nature of the pyloric thickening (hypertrophy, ulcer or cancer) at the operation is the decisive factor in the choice between the last mentioned surgical method and resection. JOHN J. MALONEY, M.D.

Berg, B. N.: Gastric Ulcers Produced Experimentally by Vascular Ligation. *Arch. Surg.*, 1947, 54, 58.

Virchow's hypothesis that human gastric ulcers were vascular in origin led to several attempts to reproduce similar lesions in animals by ligation of the gastric vessels. For the most part no significant results were obtained.

In human beings the anatomic arrangement of the blood supply of the stomach is practically the same as that in dogs.

The rat's stomach is divided by a transverse ridge into two parts, a nonsecretory rumen or forestomach

In general, the total volume of gastric secretion was markedly reduced by vagotomy as well as the free hydrochloric acid content of the fasting stomach. While most of the patients showed a decrease or absence of free hydrochloric acid after vagotomy yet in 4 patients it had no demonstrable effect on the free hydrochloric acid levels.

One of the most striking results of vagotomy is the immediate, complete, and apparently permanent relief of pain. It would seem that there are 4 possible explanations for this phenomenon (1) the effect of anesthesia (ethylene ether) (2) interruption of the sensory pathways (3) decrease or absence of free hydrochloric acid and (4) decrease or absence of the peristaltic activity of the stomach. The effect of the anesthesia is transient and it would seem that the pain would certainly recur. It is difficult to prove that the pain pathways have not been interrupted. However, it is generally believed that visceral pain is carried by the splanchnic nerves. Furthermore, distention, traction and probably heat and cold are perceived by the patient after vagotomy. It is improbable that the relief of pain is due only to the decrease or absence of hydrochloric acid because in 4 patients who had normal free hydrochloric acid levels after vagotomy the pain was immediately relieved and did not recur. Also the introduction of free hydrochloric acid immediately after vagotomy and on several occasions later in 2 patients in this series and in 2 others not included in this report caused no pain, whereas, each patient had experienced typical pain after this procedure before operation.

Dilatation and delayed emptying of the stomach were a constant finding after vagotomy except in those patients who had a previous gastroenterostomy or gastric resection. The most striking effect of vagotomy in this series of patients was the reduction or absence of gastric motility so much so that one wonders if this is not the most likely explanation for the immediate relief of pain and subsequent healing of the ulcer.

CHARLES BARON M.D.

Brown, C. H., Colevert, J. R., and Brush, B. E.: Gas-troileostomy: A Rare Surgical Error; Symptoms and X-ray Findings. *Gastroenterology* 1947 8: 71

The common complications of gastrojejunostomy are well known, namely gastrojejunitis, gastrojejunal ulcer, nonfunctioning gastrojejunostomy stomas, perforation of a marginal ulcer, and gastrojejunal colic fistula. Rarer but none the less typical is the syndrome which occurs in patients in whom a gastroileostomy was done by mistake.

The authors briefly review the literature and find only 22 cases of gastroileostomy which have been reported. Because of the obvious importance of this surgical error and the necessity of promptly recognizing its signs and symptoms the authors present 3 additional cases of gastroileostomy and analyze the syndrome.

The predominant symptoms are loss of weight, pain, vomiting, which may be fecal in type, and diarrhea. In 1 of the present cases reported it is sig-

nificant to note that the patient actually tasted soap following a soapuds enema on the fifth postoperative day. The stools may contain undigested food material. Whether diarrhea or vomiting predominates apparently depends upon the patency of the pylorus and the operative stoma when the stomach is filled. Malnutrition and weight loss may be marked due to interference with normal digestion and assimilation. Pain is a common symptom and may be severe. Hemorrhage was present in 3 of the 22 cases. Ileac ulcer was not as common as might be expected from the fact that unneutralized acid gastric chyme came in direct contact with the mucous membrane of the ileum.

X-ray examination including particularly serial barium meal films of the gastrointestinal tract is most helpful in diagnosis. Two of the 3 cases reported showed refilling of the stomach some hours after it had emptied an x-ray sign not previously emphasized. This is probably the result of the fact that the barium passes through the patent pylorus into the duodenum through the jejunum and then through the gastroduodenal stoma back into the stomach.

In the authors' series of 3 cases simple disconnection of the gastroileostomy promptly produced satisfactory results. However in 1 of the patients a partial gastrectomy was also performed.

EDWARD F. LEWIS, M.D.

VanLiere, E. J., Stickney, J. C., and Northrup, D. W.: Comparative Study of the Effect of Anesthetic Agents on the Propulsive Motility of the Small Intestine. *Gastroenterology* 1947 8: 82

In studying the problem of propulsive motility of the small intestine as affected by various anesthetic agents the authors are underscoring and trying to shed additional light upon the well recognized fact that disturbances of intestinal motility play a very important role in the incidence of morbidity and mortality in the postoperative period. It is, however, unfortunate that "postoperative ileus and related disorders cannot be explained on the basis of a single etiological factor. The type and duration of the operation as well as the care and gentleness with which the intestines are handled are all important factors among many others, in the problem of postoperative complications. Nevertheless any experimental evidence which seeks to provide additional information on the incidence and cause of such disturbances following abdominal surgery is of value even if the results are somewhat confusing and the interpretation subject to cautious consideration.

The effects of cyclopropane, chloroform, ether, ethylene nitrous oxide, and a number of barbiturates on the propulsive motility of the small intestine were studied experimentally in 128 dogs.

In group A a charcoal mixture was given by stomach tube to normal dogs. At the end of 30 minutes they were sacrificed and the distance the mixture had been propelled by peristaltic action was measured. In group B the dogs were first anesthetized and the charcoal mixture put directly into the

10 Clinical course. This is essentially the same as that of a bulbar ulcer. Medical therapy was efficacious in 10 of the authors 16 cases being associated with both clinical and roentgenological improvement, although in some cases there was a persistence of duodenal irritability and aciditization.

EUGENE J. ADRI, M D

Kittle C. F., Jenkins, H. P. and Dragstedt L. R.: Patent Omphalomesenteric Duct and Its Relation to the Diverticulum of Meckel. *Arch Surg* 1947 54 10.

A presentation of the history embryology anatomy pathology relation to other congenital anomalies, and sex incidence of the diverticulum of Meckel is given. The relationship between it and the patent omphalomesenteric duct is discussed.

One hundred and two cases of patent omphalomesenteric duct and 26 additional cases in which prolapse of the intestine occurred through this structure were collected from the literature. These are briefly summarized.

Two new cases of uncomplicated patent omphalomesenteric duct and 1 case with prolapse are presented.

The clinical features, diagnosis, and treatment of this condition are discussed.

Operation for excision of the patent omphalomesenteric duct should be undertaken as soon as the condition is diagnosed to avoid the hazard of intestinal prolapse.

JOHN J. MALONEY M D

Gardner R. H.: Volvulus of the Cecum. *Brit M J.* 1947 1 83.

Volvulus of the sigmoid is a well known condition, while volvulus of the cecum is still believed to be rare. The author believes it is not so uncommon as supposed and cites 15 cases reported in 5 years, including 3 personal cases. He believes the condition should be more widely recognized since the mortality rate is very high if treatment is withheld. Partial torsion may occur in recurrent attacks over a period of years sometimes culminating in an acute complete torsion. It also may cause obscure abdominal pain or discomfort, or stimulate some cases of subacute appendicitis. Obstetricians should realize that this condition is likely to complicate pregnancy and the puerperium.

Wolfer (1942) reported 304 cases from the literature with mortality rates between 50 and 60 per cent in operative cases and rising up to 100 per cent in nonoperative cases. It should be possible to bring this high mortality rate down with early diagnosis and treatment.

In the third stage of the embryological rotation of the gut, the cecum lies beneath the liver and descends to the right iliac fossa finally becoming fixed to the posterior abdominal wall, and its mesentery disappears. If this fixation and disappearance of the mesentery fails to take place, the cecum and ascending colon are variably mobile in accordance with the length of this mesentery. Sometimes there is even a

common ileocecalocolic mesentery. This renders the cecum and a varying amount of the right half of the colon liable to torsion. Points of fixation at the base of this mesentery—at the hepatic flexure or where the transverse colon crosses the duodenum—frequently act as hubs around which the torsion occurs.

The frequency of this nonfixation of the cecum and right colon is given at from 15 to 25 per cent. Any of the cases in this group may develop a volvulus. Rarer causes are errors of rotation (nonrotation, reversed rotation, and nondescent of the cecum). The twist more commonly occurs in a clockwise direction.

Males are afflicted more often than females in a 3 to 1 ratio and one-half of the patients are between the ages of 20 and 40. Exertion or heavy occupations may account for the male preponderance. Trauma sudden or gradual changes in position of the viscera, (as seen in pregnancy or the puerperium) mesocolic inflammation dietetic errors gaseous distention or violent purgation may be exciting causes.

The author divides the cases into 3 types according to their rate of onset and manifestation of symptoms.

1 Acute cases come on within a few hours and cause violent abdominal pain, vomiting and constipation followed by abdominal distention—signs of acute obstruction. These cases are rapidly fatal and must be subjected to operation in good time.

2 The subacute cases give a history of several hours up to more often, 3 or 4 days of variable abdominal discomfort or distention, pain and tenderness. The pain may be epigastric or in the right lower quadrant. The temperature and pulse often remain normal. The patient will nearly always recall similar attacks of a milder nature which have passed off without incident (indicating a volvulus that has righted itself). Tenderness is usually present and is localized over the distended gut and the area of peritonitis developing over and around it. Distention is usually gross and roentgenograms of the abdomen will frequently be diagnostic.

3 The chronic cases show a transient partial volvulus which sooner or later untwists. These cases are associated with right lower quadrant pain, tenderness and varying degrees of distention. Histories of distention suddenly relieved by the passage of a large amount of flatus are often of great importance in the diagnosis.

This condition has been reported as an acute complication of pregnancy or the puerperium. Rose believes that volvulus may be the cause of distention early in the puerperium and that laparotomy should be seriously considered if it refuses to respond to treatment in 24 hours post partum.

The treatment of volvulus consists of early laparotomy and care of the gut according to the state in which it is found. If it is viable derotation with or without fixation or derotation with a cecostomy to decompress and drain the bowel is indicated. If it is gangrenous, exteriorization and removal with the cautery and subsequent closure of the enterostomy or resection (right hemicolectomy) and anastomosis of the ileum to the transverse colon is indicated.

Adequate preoperative treatment as far as time will allow is important. Blood and fluid should be replaced. Gastric suction and lavage are of value before and after operation.

Fixation of the viable bowel may be achieved by Waugh's method, by fixing the appendectomy stump to the anterior abdominal wall with a pursestring suture or by cecostomy fixation. Very careful handling of the distended friable gut is essential.

The author's 3 cases are presented in detail.

ROSCAR R. BIGGLOW M.D.

Mirrish L.: Diverticulitis of the Cecum. *Clin Proc Cape Town*, 1946, 5: 354.

This is a case report of a patient with multiple diverticulitis of the colon. The interesting phase of this report is that there were several diverticula of the acquired type in the cecum. Solitary diverticula of the cecum are encountered not infrequently they are usually congenital in type. Most cases of cecal diverticulitis are diagnosed as acute appendicitis when one of the cecal diverticula becomes inflamed.

In this case the clinical picture did not appear to resemble acute appendicitis with abscess formation but seemed more like carcinoma of the cecum. The diagnosis was confirmed by roentgenography and the patient recovered without surgery.

HAROLD LAUTMAN M.D.

Koch F.: A Contribution to the Operative Treatment of Cancer of the Rectum. *Acta chir scand* 1947 93: 143.

In the Surgical Clinic of Malmö in Sweden the favored procedure in the treatment of carcinoma of the rectum during the last 30 years has been to operate in one stage and preserve the anal sphincter whenever possible. The reported material consists of 276 cases of rectal cancer.

The majority (56 per cent) of patients in this series did not seek medical aid until symptoms had persisted 6 months or more. Twenty-one per cent of the patients sought medical aid earlier but the nature of the lesion was not diagnosed. The author found that radical operability in delayed cases was reduced to 17 per cent while in all other cases the operability was 36 per cent. These figures are considerably lower than in most large series reported in recent years.

The choice of method for radical operation is largely governed by two considerations: whether the sphincter can be spared and whether the operation can be performed in one stage. It is the author's contention that, whenever possible, the sphincter should be preserved and every attempt is made to complete the operative procedure in one stage. In the present series there were 87 radical operations, of which 66 were resections with preservation of the sphincter. There was only a 7.5 per cent incidence of postoperative urinary retention in the series. All of the patients in these cases recovered after a few days of catheterization with no serious complications of the genitourinary tract. The author attributes this ex-

cellent record to great care in avoiding damage to the blood supply of the bladder.

The immediate mortality was 21 per cent. In 8 cases the cause of death was peritonitis originating from the wound. In 6 it was failure of the circulatory apparatus. In another 6 the patients died in the hospital 1 month or more after surgery from various complications such as pneumonia and thromboembolic phenomena. If the latter 6 cases are included, the hospital mortality was 30 per cent. Apparently all patients in whom the sphincters were preserved had good control upon discharge from the hospital.

Follow-up examination revealed that there was a 64 per cent incidence of 3 year cures and a 50 per cent incidence of 5 year cures. None of the patients who were re-examined complained of defective control of the anal sphincter. On the basis of the material in this report, the author believes that preservation of the sphincter does not appreciably alter the result as compared with those of other radical resections and therefore recommends this procedure whenever feasible. He claims that disturbances in sphincter control and the presence of persistent focal fistulas have been overestimated in the literature, especially since neither of these complications occurred in any of his cases.

HAROLD LAUTMAN M.D.

Swinton N.W.: Pruritus Ani. *England J M* 1947 236: 169.

The etiology of anal pruritus is not definitely known and there may be several etiologic factors involved in many of the cases. Some precipitating factor begins anal pruritus. It often follows a period of diarrhea, constipation, fatigue, worry or nervous tension. The symptoms may be transient or may set up a cycle of scratching and itching that is progressive. It is of value in all cases for the doctor to spend time with the patient talking over the possible causes and explaining the mechanism of the scratch-itch cycle and the importance of avoiding scratching.

The anorectal area contains a sweat apparatus, the apocrine system which is part of the sexual glandular system. Its excretion is alkaline and contains protein and excess carbohydrate. It is responsible to emotion and sexual tension.

Fungus infections have been found to be present in as high as 60 per cent of the cases of anal pruritus by some writers, but the author's study did not support these findings. Various bacterial organisms, probably of little importance, have been described.

Food allergies have occasionally been found, but it is difficult to evaluate them. Excess carbohydrate in the diet increases the alkalinity around the anus and increases the local hydration. Fruit juices have a similar effect and alcohol may be important as a peripheral dilator.

The sodium salts of fatty acids in soap, the sulfite in some toilet papers, the phenolphthalein in laxatives, and the mercury in some surgical lubricants may increase the focal irritation.

The psychogenic factor is important, and nearly all patients with an intractable itch give histories of

episodes causing tension. There is an anal erotic type of anal pruritus. Sexual problems enter into many cases.

Anal abrasions, fissures, fistulas, hemorrhoids, skin tags, a contracted anal ring, or infected crypts may be precipitating factors.

Therapy of these cases must stress treatment of the entire patient as contrasted with the usual tendency toward intense local therapy. Rest, relaxation, and relief from tension must be attained by sedation and hospitalization if necessary. Alcohol, carbohydrates and roughage are reduced in the diet. Cleanliness is stressed; cotton and water should be used to cleanse the area, and toilet paper, soap, and direct manual contact with the anus should be avoided. Potassium permanganate (65 mgm. to 1 liter) in hot water is used in mild cases and patients are advised to sit in it as often as necessary. Burrow's solution and dilute Castellani carbolfuchsin paint, with or without resorcinol, are helpful. Ointments are avoided.

There are definite indications for surgery in these cases, but they are few and are becoming less with the greater experience in the handling of such cases. Alcohol and other injections have the common denominator of producing local anesthesia and should be reserved for severe cases. When such treatment was indicated, the author had his best results following the Bule technique of alcohol injection.

FREDERICK C. HOESLI, M.D.

LIVER, GALL BLADDER, PANCREAS, AND SPLEEN

Ivy A. G.: Motor Dysfunction of the Biliary Tract: An Analytical and Critical Consideration. Caldwell Lecture, 1946. *Am. J. Roentg.*, 1947, 57.

Does biliary dyskinesia exist as a clinical entity and how can it be diagnosed? This article is an analysis of the present state of the problem.

Anatomically the gall bladder has a fibromuscular layer but muscular fibers are sparse in the cystic, hepatic, and common bile ducts. Embryologic evidence shows that the sphincter of Oddi develops independently of the duodenal musculature. There are four intrinsic muscles in the sphincter and ampulla of the adult. There are two longitudinal bundles which shorten the duct and erect the papilla. There is an annular sheath around the common duct from the point where it enters the duodenal wall to where it joins the pancreatic duct. There is an annular sheath around the terminal end of the pancreatic duct in about one third of the adults and around the ampulla in about one-sixth of the adults. Hypertrophy of the sphincter of Oddi has been reported and is said to occur after cholecystectomy.

Physiologically the gall bladder evacuates under the force of its contraction which is initiated by cholecystokinin, a hormone elaborated by upper intestinal mucosa when in contact with fat or partially digested protein. When injected intravenously

cholecystokinin will evacuate the gall bladder in dogs and man. In dogs the maximum force of the contracting gall bladder amounts to from 20 to 25 cm. of water pressure which is lower than the secretory pressure of bile and pancreatic juice which ranges from 25 to 30 cm. of water pressure.

In all animals that have a gall bladder we may believe, the common duct possesses a sphincter mechanism which is intimately co-ordinated with duodenal tone and motility but which may also act independently.

The sphincteric mechanism can exert a resistance to the flow of fluid amounting to from 60 cm. to 80 cm. of water pressure in the dog and therefore presumably it is possible for a spastic sphincter to resist a flow greater than the capacity of the gall bladder to contract and greater than the secretory pressure of the liver. The normal resistance of the sphincter in the cholecystectomized human being ranges from 0 to 23 cm. of water pressure and usually ranges from 10 to 15 cm. of water pressure.

In the dog after a meal of infected cholecystokinin, the gall bladder contracts and the sphincter of Oddi relaxes. In man the sphincter is known to relax in the presence of a fatty meal. This demonstrates a probable reciprocal innervation which if disturbed could cause pressure in the biliary tract and produce symptoms.

The source of pain in the biliary passages has been investigated but in human beings the evidence is meager principally because experiments were made in the presence of inflamed bile passages in which the pain threshold was lowered. In dogs 27 cm. of water pressure which is approximately equivalent to the maximum contraction of the gall bladder and secretory pressure of bile produced pain. All experiments through T tubes in human beings indicated that a sudden increase in intraductile pressure produced pain while a gradual increase did not and that the greater inflammation of the passages was accompanied by a lower pain threshold. Duodenal spasm as the cause of pain was ruled out in one series of experiments by the presence of an intraduodenal balloon.

Normal patients and patients operated upon some time previously have been investigated in three ways. First, with a duodenal tube in place olive oil was injected to cause contraction of the gall bladder. Pilocarpine causing sphincter spasm, was then injected. This produced distress and the flow of bile ceased. Atropine was then injected and the distress disappeared as the bile reappeared. In the second experiment dehydrocholic acid which causes brisk bile formation, was injected intravenously into a patient with stenosis of the common duct and caused pain. This was confirmed on the dog. In the third experiment, secretin-cholecystokinin was injected intravenously in a patient following the introduction of a duodenal tube and obtaining bile. In 3 of the 19 patients the flow of bile ceased before the injection only clear pancreatic juice was obtained following the injection and the patient developed right hy-

pochoondrial distress. Magnesium sulfate in the duodenum relieved the distress and produced a copious bile flow.

Only manometric studies can make a diagnosis of motor dysfunction of the sphincter of Oddi at present. In the presence of a gall bladder delayed evacuation during a cholecystogram has been considered of diagnostic aid but evidence is contradictory and meager. The stimulus of a fatty meal is too variable for standardization of the procedure. Visualization of the hepatic ducts with a normal gall bladder *in situ* may occur with or without pain, generally the latter and is, therefore, neither helpful nor easy to explain.

The author suggests studying such patients with secretin-cholecystokinin as outlined in conjunction with cholecystography and attempts to visualize the hepatic ducts during cholecystography by feeding three egg yolks in milk. The latter could also be introduced into the duodenum directly and the patient given morphine hypodermically to contract the sphincter of Oddi in order to observe whether pain occurs during gall bladder contraction.

Postcholecystectomy colic in the absence of organic causes, or gross liver or bile duct disease must be considered as being due to sphincter spasm. In some cases if the colic is induced by $\frac{1}{4}$ gr. of morphine the diagnosis may be strongly suspected. A more radio-opaque dye than now exists and which would be excreted by the liver in sufficient quantities to visualize the ducts without concentration could help in the diagnosis. **FREDERICK C. HOSACK, M.D.**

Varco R. L.: Intermittent External Biliary Drainage for Relief of Pruritus in Certain Chronic Disorders of the Liver. *Surgery* 1947 43

Pruritus caused by certain chronic disorders of either the hepatic parenchyma or the intrahepatic biliary system (chronic hepatitis or cirrhosis) causes unrelenting annoyance and is intractable to the therapy now customarily employed dihydroergotamine (intramuscular) procaine hydrochloride (intravenous) sedatives, hypnotics, and analgesics.

Varco reasoned that if it is true that the intractable pruritus is caused by the abnormal retention of bile salts then the development of a method for the reduction of the serum bile salt should constitute a rational therapeutic approach to this problem. As a result of the previous studies by Whipple and his collaborators it was believed that because 90 per cent of the total quantity of bile salts secreted each 24 hours is resorbed from the intestinal tract, recirculated through the liver and then re-eliminated in the bile, only pre-enteric deviation of the bile would reduce the serum bile salt level.

Upon translating these conjectures into surgical procedures it was determined that intermittent external biliary drainage suffices to attain and maintain prompt and virtually complete relief from the type of pruritus under consideration. The most effective operative procedure for this purpose is cholecystostomy and drainage of the common bile duct with a T-tube, size 10 to 12 French.

Small quantities of bile salts were given orally upon 3 occasions to patients who had an external biliary fistula. Pruritus promptly returned and then disappeared with the maintenance of intermittent external biliary drainage. **ROMER TUCKER, M.D.**

Mallet-Guy P., and Jeanjean R.: Surgical Equivalents in So-Called Medical "Jaundice" (Ictères biliaires chroniques dans les ictères dits "médiés") *Lyon chir.* 1946, 4: 1389.

The author discusses the possible surgical complications of infectious jaundice, particularly dyspeptic disturbances persisting after subsidence of infectious jaundice relapsing episodes of jaundice, and abnormal prolongation of jaundice.

If surgical exploration for one of these conditions fails to reveal a lesion in the biliary tract or the head of the pancreas, the symptoms are probably due to (1) hypertony of the sphincter of Oddi, (2) hypotony of the sphincter of Oddi, or (3) a variable degree of compression of the common bile duct usually associated with a chronic pancreatitis.

These may be differentiated from one another by manometric and roentgenographic studies of the biliary duct system made by cannulating the biliary tree at the time of operation. Usually the surgeon will find a precise disturbance of biliary function, either a relative degree of obstruction due to pancreatitis or a hypertonic or hypotonic sphincter of Oddi.

For obstruction due to pancreatitis, cholecystostomy is indicated. Biliary anastomosis is not indicated unless the obstruction is great enough to indicate some other condition than infectious jaundice. Similarly for cases of hypertonicity of the sphincter cholecystostomy appears to interrupt the evolution of sphincter spasm. However when the hypertonicity is too severe to be relieved by simple drainage, transnodal sphincterotomy is preferable and restores a more normal tonicity of the sphincter. If on the other hand, a state of atony of the biliary tract and sphincter exists simple drainage of the gall bladder is the preferred treatment. In some of these cases splanchicectomy also is of value.

EDWARD W. GIBBS, M.D.

Clavel, G., and Durmaz, J.: Acute Calculous Cholecystitis in Children (La cholecystite calculuse aiguë chez l'enfant) *Lyon chir.* 1946, 4: 141

Acute calculous cholecystitis is rare in infants and children. The authors collected 103 cases and found that the greatest incidence of lithiasis in children occurred prior to the age of 1 year and just before the age of 15 years. Calculous cholecystitis is rare before the fifth year of age. Before the age of 10 acute cholecystitis occurs more frequently in males, but after the age of 10 the incidence is greatest in females.

The classical list of predisposing causes of calculous cholecystitis in children includes typhoid fever, scarlatina, grippé, pneumonia, upper respiratory infection, gastrointestinal illness, intestinal parasites, appendicitis, and heredity. However in many cases

neither the antecedent history nor the operative findings suggested any definite predisposing cause.

There is nothing characteristic about the pathological findings in infants. Calculi of varying size number, and chemical composition are described. Examination of the gall bladder wall and lumen discloses the characteristic findings of acute cholecystitis, of catarrhal, suppurative or gangrenous type.

There is no doubt of the congenital origin of calculi for they have been described in the newborn and even in the fetus. In infants and children the pathogenesis appears to be the same as in adults except for the sudden increase in frequency of the disease in girls just before puberty which suggests an endocrine or vagosympathetic disturbance.

In a clinical study of 28 cases the authors found 8 cases of suppurative cholecystitis, 1 case of gangrenous cholecystitis, 10 cases of catarrhal cholecystitis, and 3 cases of cholecystitis with the complication of perforation or fistula formation.

Appendicitis is the most common diagnostic error. However in infants there are a certain number of gall bladder syndromes without lithiasis namely typhoid cholecystitis, scarlatina cholecystitis, external compression of the biliary tract by adenopathy, intestinal worms and acute noncalculous cholecystitis. Also lithiasis is seen without cholecystitis and in some cases of hemolytic icterus.

The diagnosis is based on symptoms of pain, constipation, high fever and leucocytosis with a predominance of polymorphonuclear cells, added to the picture of noncomplicated lithiasis producing painful crises and hepatic colic. If this picture can be distinguished from other acute peritoneal syndromes by its localization and clinical history an accurate diagnosis can be made.

Congenital lithiasis often associated with malformations of the biliary passages, is frequently fatal. Acquired cholelithiasis, if recognized and treated surgically bears a good prognosis.

The authors recommend early operation. Although cholecystostomy might at first seem to be particularly indicated in infants and children, the frequently encountered advanced changes in the gall bladder wall will often necessitate removal of the gall bladder.

EDWARD W. GIBBS, M.D.

Muir J. B. G.: Surgical Hazards in the Treatment of Cholecystitis and Cholelithiasis. *Austral N Zealand J Surg* 1946, 16: 14.

The author reviews the surgical hazards and results of 421 operations on the biliary tract. The pathological condition, the type of operation performed, and the causes of death in each group are discussed.

Two hundred and seventy-five cholecystectomies were performed for chronic cholecystitis and cholelithiasis, with 6 deaths—one due to pulmonary embolism, 3 to hepatorenal syndromes and 2 to internal hemorrhage. Cholecystostomies were done in 3 cases, with no deaths.

When surgical treatment was carried out in the presence of acute inflammatory changes in the gall

bladder the mortality rose from 2.18 per cent to 18.4 per cent. In all, 103 cases were recorded in this group and the pathological findings at operation included acute cholecystitis with commencing gangrene, perforation and peritonitis, cholecystododenal fistula, pancreatitis communicating with liver hydatid and empyema of the gall bladder.

Cholecystectomy performed in patients with acute cholecystitis carried with it a mortality of 20.6 per cent whereas the mortality following cholecystostomy was 15 per cent, despite the fact that it was selected for the poor risk cases.

The question whether cholecystitis in the acute stage should be treated conservatively or with immediate operation is discussed at length. Muir believes that generalization is impossible and that each case of acute cholecystitis should be treated on its merits, the patient being under observation in the hospital. Consideration of the local pathological process should always be borne in mind. Apart from a small proportion of Welchii infections, the organisms causing cholecystitis are usually *Bacillus coli* and streptococci of low virulence. In the early stages the inflammatory process is catarrhal in type, and limited to the mucous membrane and submucous tissue. Provided there is no obstruction the tendency in first attacks is to subside, leaving local adhesions on the peritoneal surface of the organ and a thicker gall bladder wall.

The theory is advanced that in a number of cases of acute cholecystitis, mechanical and circulatory effects rather than bacterial infection are responsible for the principal pathological changes. The veins draining the gall bladder are much more closely incorporated with the cystic duct than is the cystic artery and so lead to edema, congestion, and infarction.

The necessity for immediate operation on the tender palpable gall bladder, it is argued, is based on the fact that the tension in the gall bladder may become so great that the blood supply is compressed, resulting in gangrene, that there is seldom any clinical indication during an attack of acute cholecystitis that pus is present, and that perforation in a "watched" case is frequently the first indication that the attack is not subsiding.

These complications of nonresolving acute cholecystitis are arguments in favor of early surgical intervention. There is little doubt that in a younger type of patient, whose liver function has not been impaired by numerous attacks of cholangitis, cholecystectomy performed in the early catarrhal stage, when the normal surgical anatomy is not badly obscured by inflammatory exudate—that is during the first forty-eight hours—is not a very formidable technical undertaking and the risk is not great. It must be remembered, however, that these patients are not always seen at that stage and have usually been sick at home for several days before admission to the hospital, so that the day of admission is by no means the first day of the attack. A careful history and assessment of the local pathological process as a